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The Wilmington Public Library: Its Inception and Development

Edward L. Tilton and Alfred Morton Githens, Associated Architects

THE design for the Wilmington Public Library was decided by competition. The successful architects lost the competition; but they won it as well, for it was an extraordinary competition, a comfortable competition, entirely among their own designs. The building committee instructed them to prepare, in conference with Mr. A. L. Bailey, the librarian, a series of three entirely different sets of plans, equally developed and drawn to the same scale. These were submitted to an art commission, Messrs. W. P. Laird, F. M. Day, and P. S. du Pont, who reported to the building committee the one they preferred. Fortunately there was complete accord among all concerned; so one of the series was selected, the general type of building thus determined, and the plans returned for further study and development.

Through the Doorway.

Now the architects, too, had been strongly in favor of the type selected. One general arrangement seemed to them by far the best, both practically and æsthetically—this experience seeming an indorsement, by the way, of the rule in competition-programmes forbidding "flaps and alternate designs"; for if a designer takes a problem seriously he can rarely regard equally well even two solutions; almost inevitably must he hold to the one and despise the other.

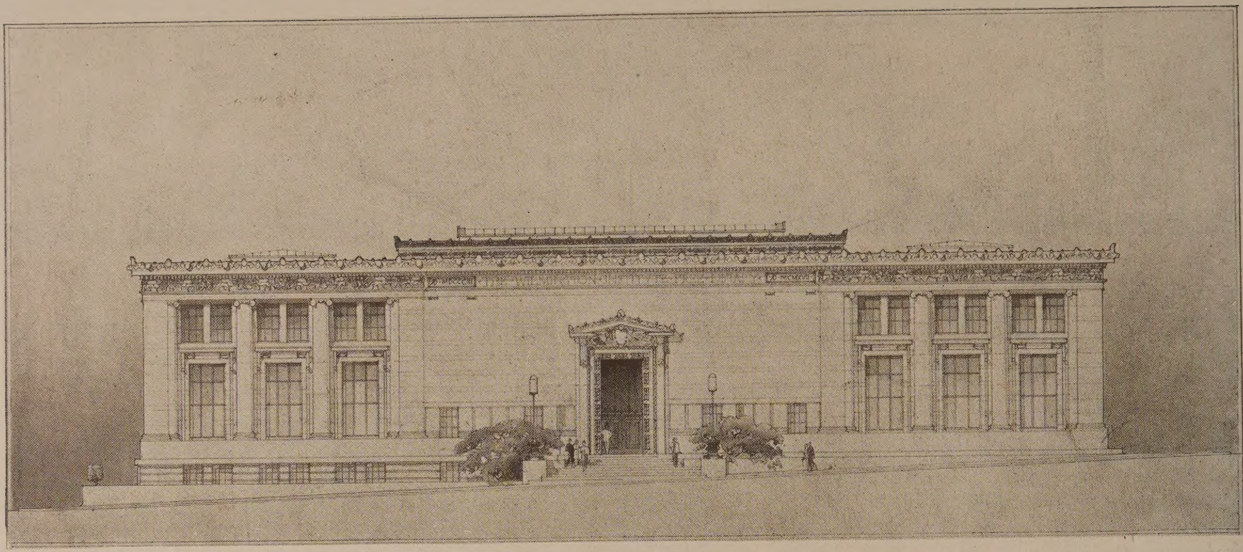
The site of the library is particularly fine. Wilmington has developed an imposing civic centre in Rodney Square, where the old city hall stood. The ground falls sharply toward the east, but its steep gradient has been used to best advantage with terracing and broad steps and a level "tapis vert" of lawn. At its foot is the City and County Building, at its head the Du Pont Hotel, and flanking the south side the new library, the site for which is some two hundred-odd feet long but only ninety feet deep. There is excellent light on both front and ends and fairly good light at the rear, for an easement prohibits construction nearer than twenty feet from the building. The scheme of plan takes advantage of this excellent light. The book-stacks are entirely below the main-floor level and reached by short stairs and lifts from the two desks. Books are better preserved away from sunlight, and the stack is thoroughly ventilated by the stairways, doors to adjoining rooms, and a series of exhaust ducts under the stack floor discharging through the boiler-room up the wide vent-duct. Thus all the main floor is preserved for readers, for book-shelves accessible to the public, and the stairways. There are but few partitions and no corridors at all; the floor is open from end to end; even the main entrance-hall is cut off by only a wood and plate-glass screen. This insures easy supervision, an unusually large proportion of useful floor space, and a sense of openness to any one within.

The second floor is carried principally by the lower tier of columns around the delivery-atrium. To the south are special workrooms, to the west the lecture and staff rooms, and to the east the art museum, containing, by the way, the finest collection extant of the work of that noted Wilmingtonian, Howard Pyle. As in the main floor, there is barely any enclosed corridor space; an open circulation behind the peristyle connects the various rooms and at the same time adds to the dignity and sense of space of the atrium.

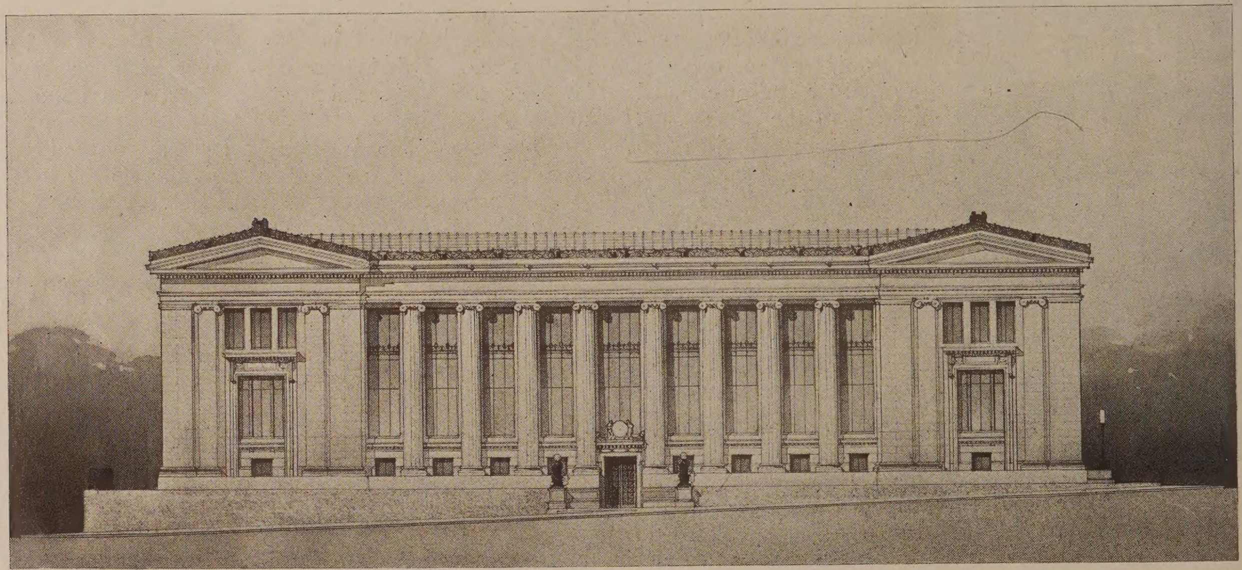
It is this sense of spaciousness that is most individually characteristic. It strikes one immediately on entering. Once through the glass doors (for the great walnut doors are rolled back into wall-pockets in the morning and remain so till closing time) the interior opens out completely. Windows are on all sides; the atrium is light as outdoors. It is an unusual plan and an unusual arrangement. We can recall only two libraries that resemble it at all—one at Springfield and one at Somerville, both in Massachusetts.

A peculiar plan implies a peculiar problem in exterior treatment. Generous window space was required along the flanking streets and toward the ends of the main façade; a doorway in the centre; but the stairway each side of it required no window space at all, since it was lighted from above and from the atrium. Accordingly, the architects seized on the possibility of a great wall surface with a gorgeous doorway in the midst, high as the ceiling would permit. The sliding doors are nineteen feet high. The forecourt is the entire Rodney Square, so a simple mass, large in scale, seemed right. The less broken the mass, the greater the effect.

It is amusing to trace this main idea, the development of a thesis, as it were; a logical principle of composition laid down as a basis, and the façade developed therefrom. Solid in the centre and open at the ends seemed against all precedent. We can recall no classic building whatever with such a composition. The authors must boldly sail into uncharted seas.



DESIGN ACCEPTED BY THE COMMITTEE.



REJECTED DESIGN No. 1.

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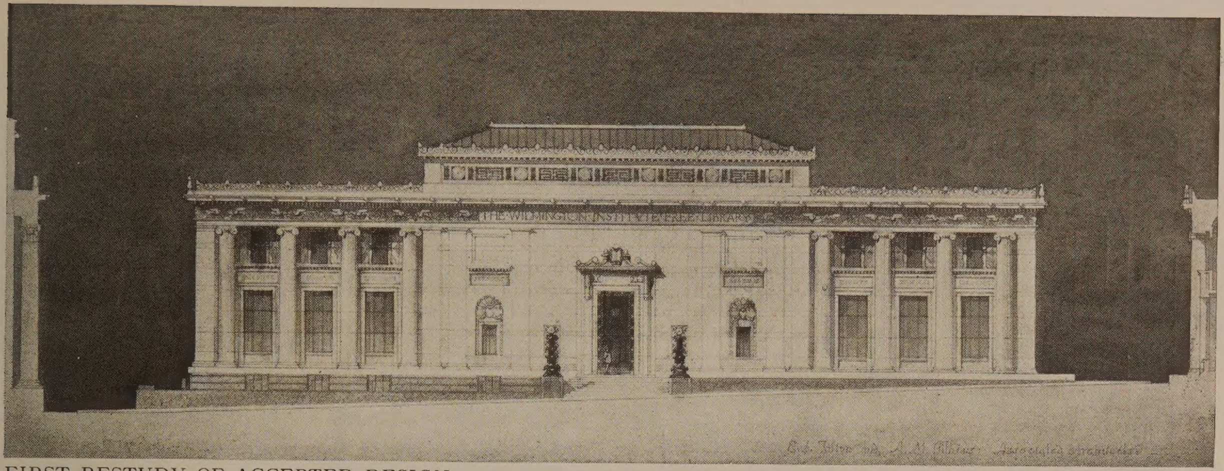
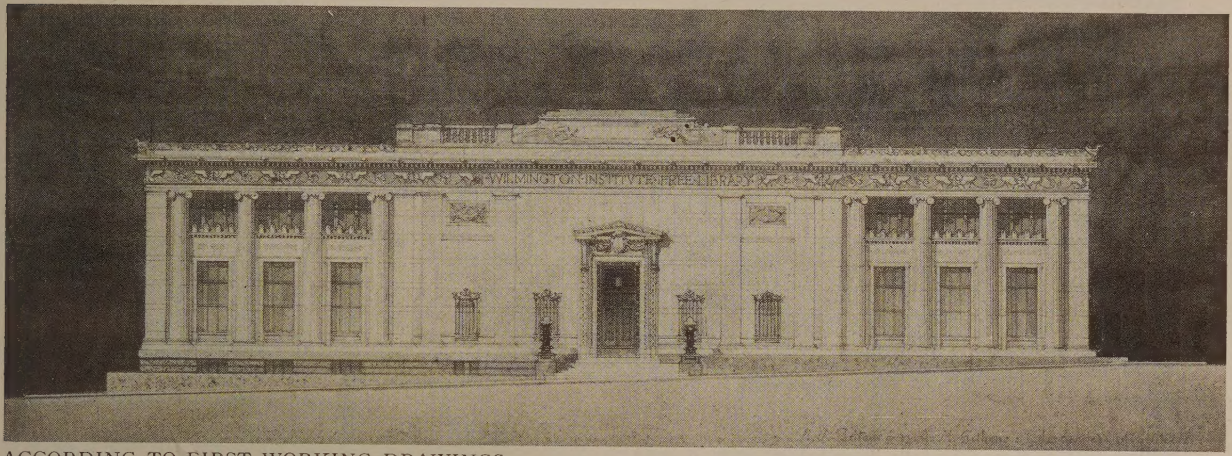
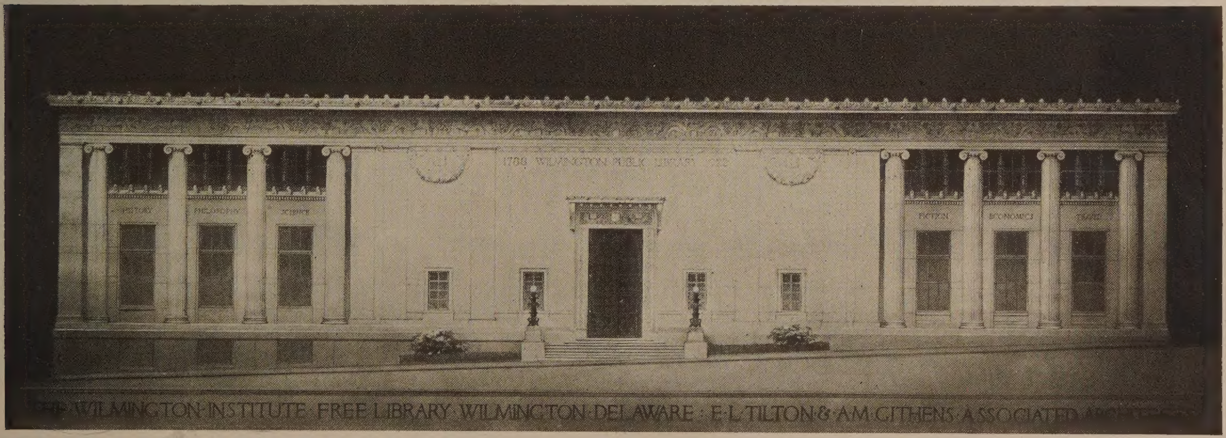


FIRST RESTUDY OF ACCEPTED DESIGN.

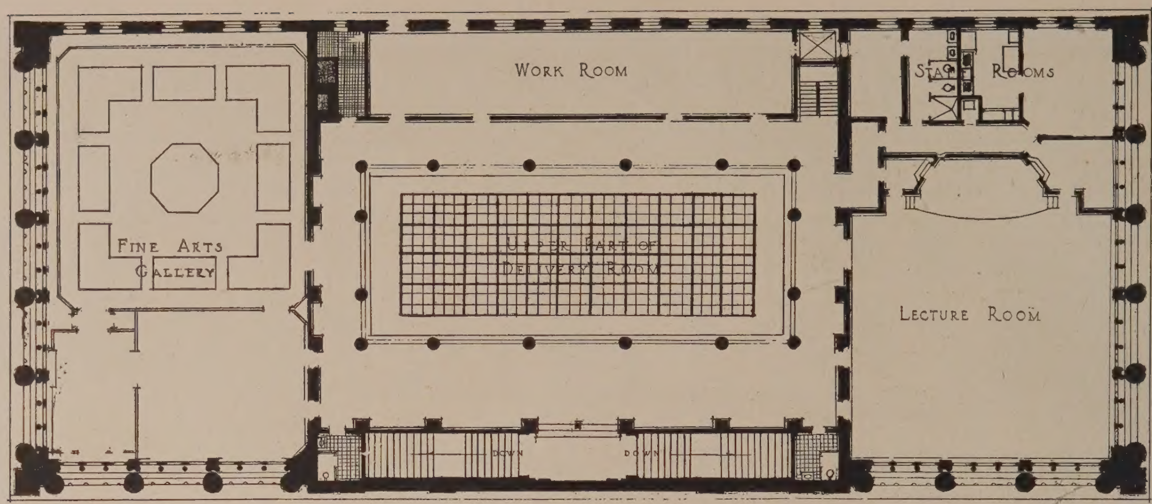


ACCORDING TO FIRST WORKING DRAWINGS.

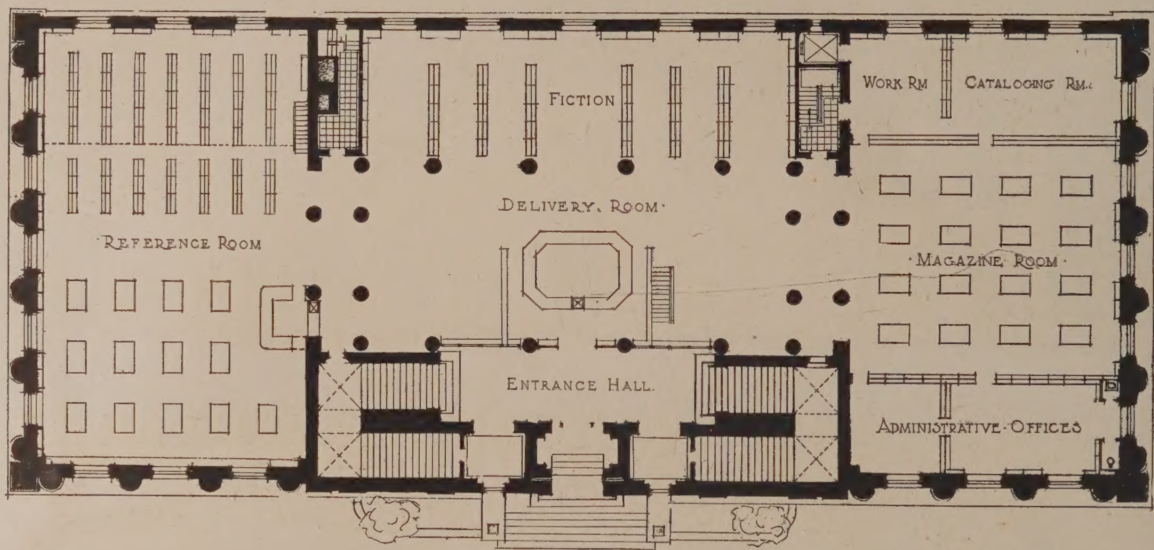
AS RESTUDIED TO MEET WAR BUILDING COSTS.



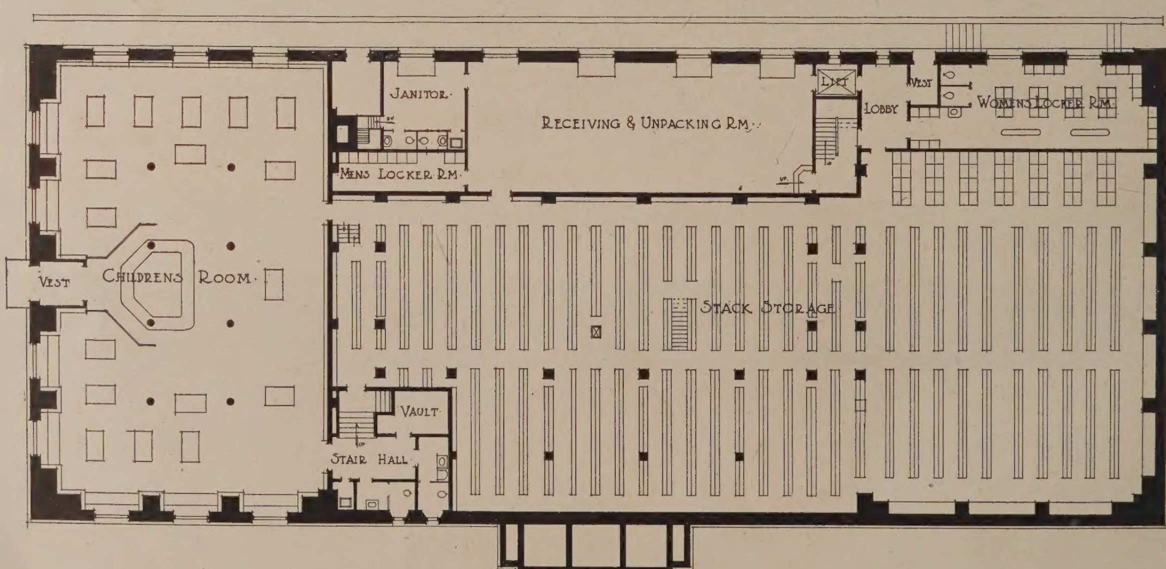
THE FINAL DESIGN EXACTLY AS BUILT.



SECOND–FLOOR PLAN.

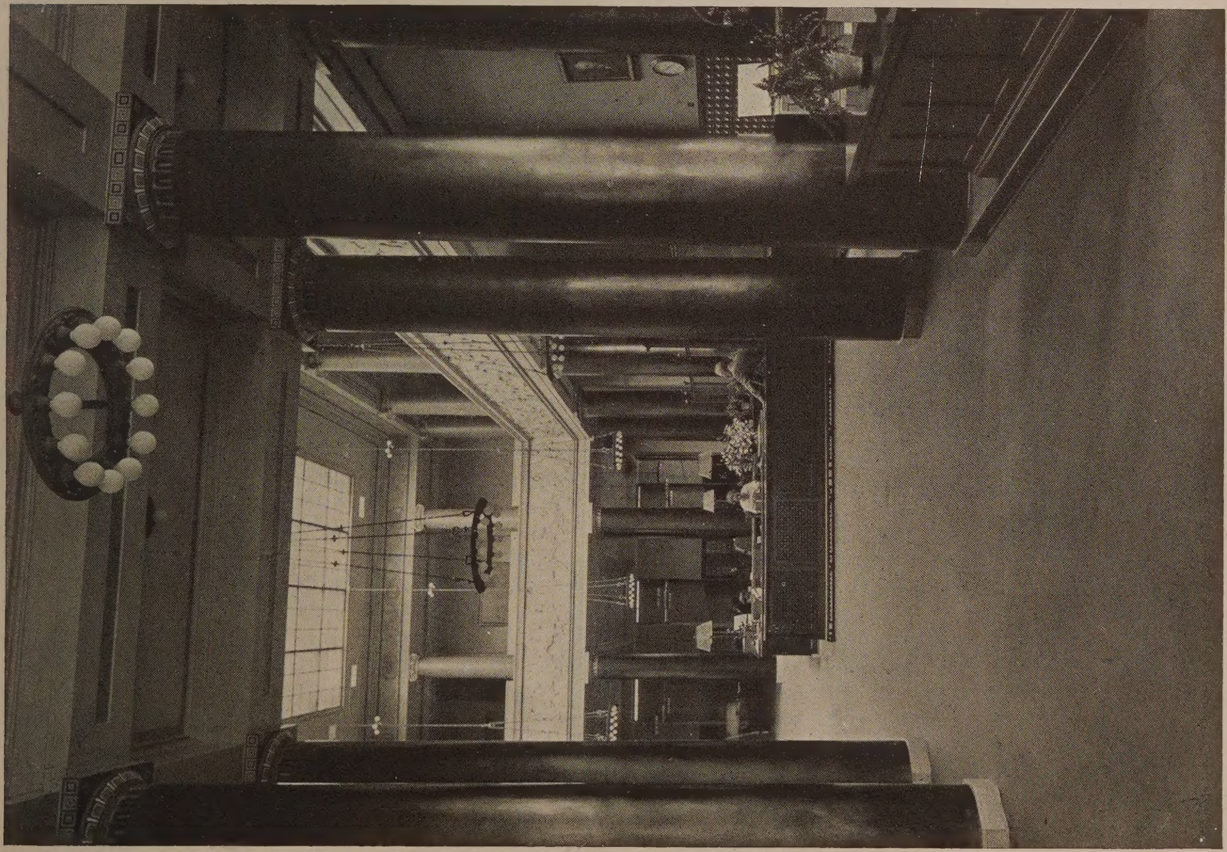


FIRST–FLOOR PLAN.

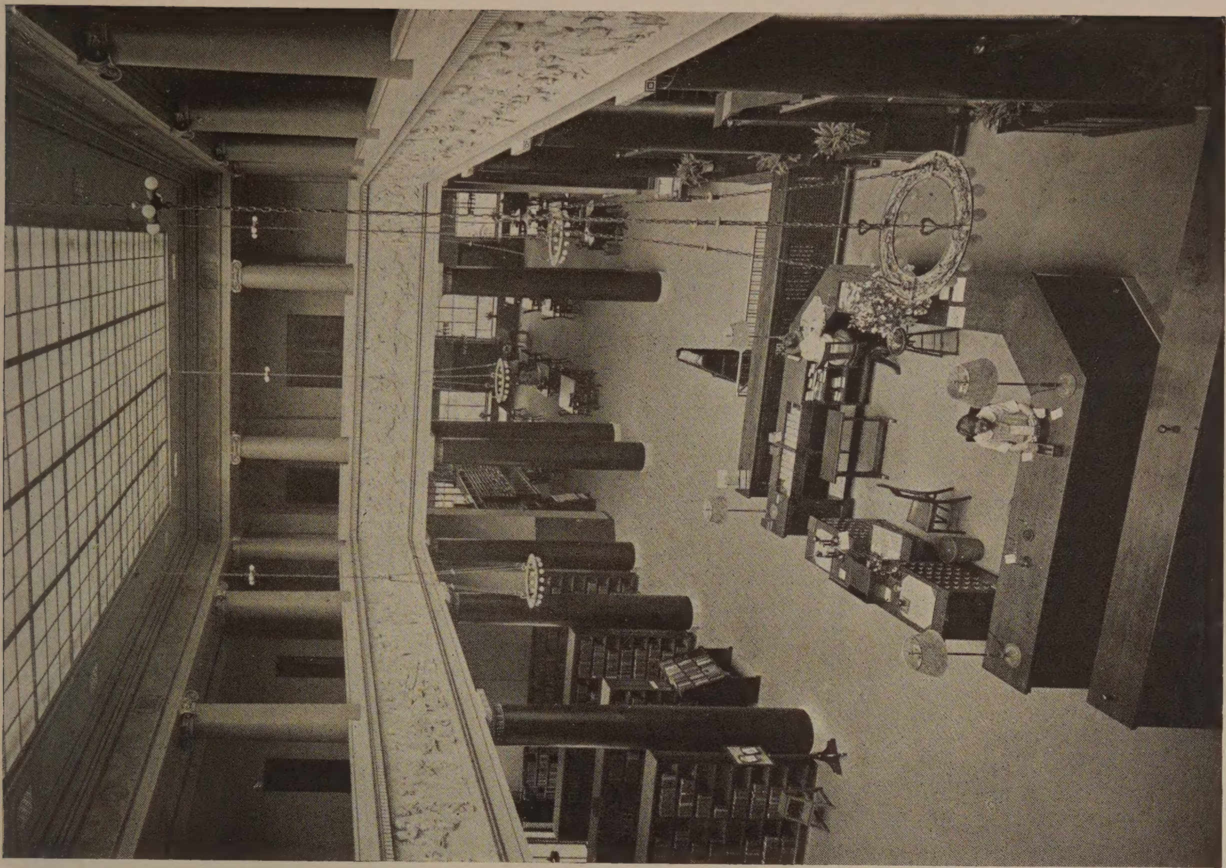


BASEMENT PLAN.

WILMINGTON PUBLIC LIBRARY, WILMINGTON, DEL. Edward L. Tilton and Alfred Morton Githens, Associated Architects.



DELIVERY-ATRIUM FROM REFERENCE-ROOM.



FROM SECOND-STORY PERISTYLE.

WILMINGTON PUBLIC LIBRARY, WILMINGTON, DEL.

Edward L. Tilton and Alfred Morton Githens, Associated Architects.

The architects tell us that when the three different designs were first presented, one of the art committee openly expressed his doubt whether the scheme were possible of successful development. He could not detect, he said, an intrinsic fault in the composition; "but since such an arrangement has never been built," he argued, "it must have been tried at some time during these last hundreds of years and abandoned because of some fault not evident to us."

However, he finally joined with his associates in approval of this particular scheme in preference to the others, and its recommendation to the building committee, with the suggestion that the central portion be more strongly linked with the wings, and of course the whole design studied in detail. They suggested raising the central portion with an attic story. Hence façade number two. Thenceforth the art committee made no general criticisms and shortly dissolved.

Detail, base of Main Doorway.

But there was no immediate hurry for completion. Funds were not yet available, the architects themselves not satisfied. So façade number three was evolved, with the attic reduced and the central portion more unified. Working drawings were prepared, preliminary estimates taken.

Then came the war. Prices rose. Carrying out such a design was impossible. The architects were asked what could be done under conditions as they then were. Accordingly, the central atrium was squeezed down to a square, the building correspondingly shortened, all ornament removed except around the great doorway.

But the building committee wisely said no; they would wait till prices were more favorable. In the meanwhile the architects should do what they could to reduce elaboration, restudy their construction, change materials within the building, and complete a new set of working drawings, so that when prices should be thought at their lowest, all would be ready for estimates and an immediate contract.

The architects were only too glad to expunge the last traces of the central attic. The cornice became terra-cotta, anchored in with the roof slab, and therefore even a coping was unnecessary, and the corona-cresting might form the sky-line.

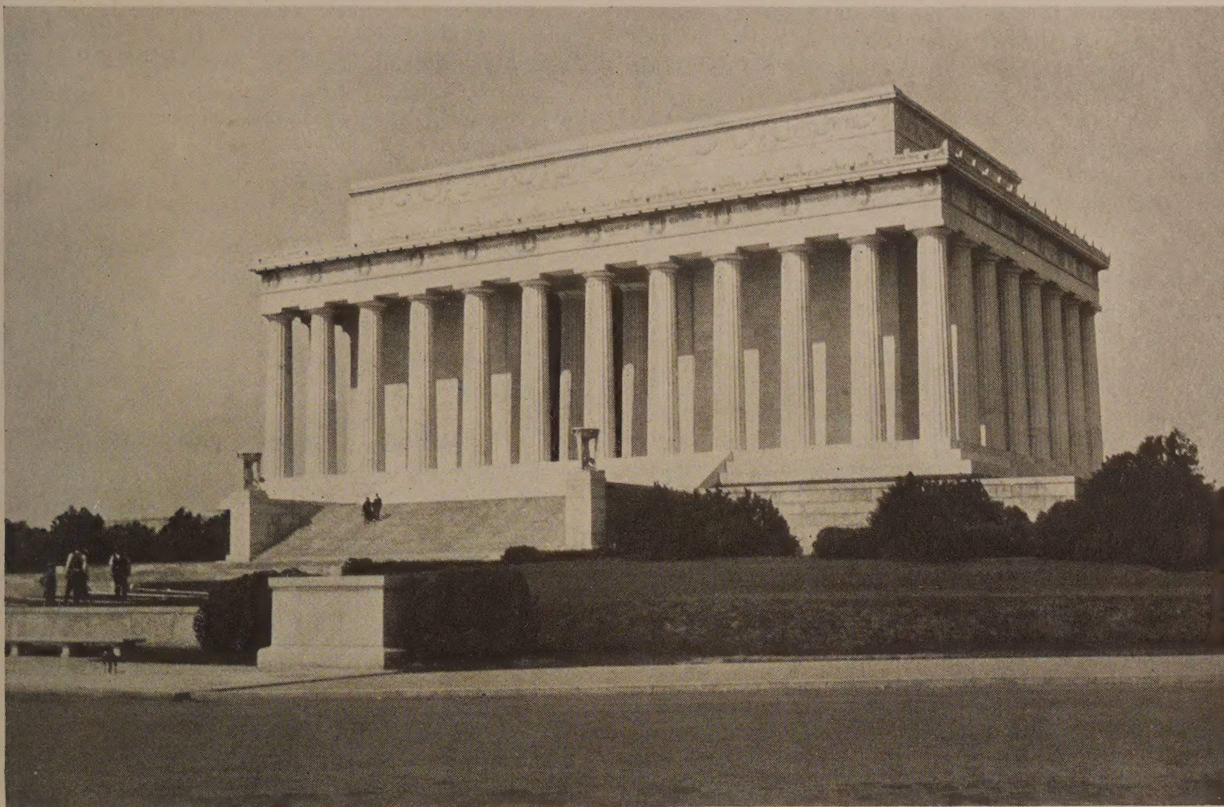
Such was the building's development. As it stands to-day, it seems vivid and rather gay and blithesome in contrast to the sober City and County Building flanking it. The brilliant band of its colored frieze, gray-brown figures against a clear yellow background, with touches of pure blue in the acanthus flowers, contrasts with its broad expanse of gray-white limestone. Within the open vestibule are the scarlet, metallic green, and ochres of Pompeiian decoration. The window-bars are gray-green, with the colonettes of the second story touched with ochre, blue, and black. The colors are strong, but they interplay and blend together across the greensward.

Inside, the colors are intense. The Doric columns of the atrium are brownish black with a slight glaze; the Doric columns above, golden yellow; the intermediate frieze of plaster casts of the Panathenaic Procession from the Parthenon, the color of old ivory; the upper frieze, in yellows and grays; all blended together by the warm light through the actinic glass of the skylight. The side panels of the hall are a varying scarlet, with decorations in colors copied directly from the Bosco Reale rooms set up in the New York Metropolitan Museum.

The surrounding reading-rooms are much quieter in color, with only the cool brown of the woodwork and yellow-gray of the walls.

Except in the entrance-hall the floors are of brown-yellow cork carpet, completely deadening the sound of a footfall. Even the main stair treads are covered with this, though the risers are of oak and the nosings of polished brass. The electric fixtures throughout are designed from Pompeiian prototypes, some of them direct reproductions, and all of oxidized bronze.

These are strong colors, but they are so blended that they are not shocking, and do not intrude themselves at first glance. The general impression is of openness and of light, strong, flooding, brilliant light.



Lincoln Memorial, Washington, D. C. J. B. C. Henry Bacon, Architect.

The Convention of the American Institute of Architects at Washington

THE selection of Washington as the place for the Fifty-sixth Convention was, in itself, a happy augury for its success, for, after all, say what we will, environment has much to do with both our development and our state of mind, while we are on the way. To bring such a body of men together as composes the delegates to the Institute, and surround them with the natural loveliness of Washington in May, and to give them the opportunity to see and appreciate something of the city is to make for progress in the dissemination of the thought of beauty throughout the land. For are not architects, by virtue of their calling, missionaries of culture, are they not shining lights in the community, beacons of good taste in the work they are engaged in, and by and large leaders in general toward a wider sympathy and understanding of what we call the arts.

To the convention came men from all over the country, bringing their personalities and something of the spirit of their local environment to exchange with their fellows. If nothing else came out of the convention than a better understanding of each other and the establishment of friendly contact, it would be worth while. After all is said and done the thing that remains in the minds of most is the impression of men. You may have known the reputation of this man, known his work, thought of him as a successful person, but you go back home and are encouraged by the consciousness that he is a good fellow, much after your own sort.

The writer is among those who carries away from the conventions the impression that no small part of their success is due to the tact, knowledge, and unfailing courtesy of the executive secretary, Mr. E. C. Kemper, aided and cordially supported, of course, by the officers of the Institute.

The convention was called to order by President Faville, on the morning of the 16th of May. In his annual address he reviewed the work of the past year. He said that with few exceptions it had been a prosperous year, and that the future gave promise of exceeding all records. To the retiring secretary, William Stanley Parker, who was elected second vice-president and director on the new ticket, he paid the following tribute:

"To Mr. Parker the Institute owes a debt of gratitude. His untiring devotion, and the capable and prompt despatch of his duties has, I am sure, endeared him to all of you. His skill, so often displayed in avoiding the 'giving of offense' in difficult and trying situations has won your admiration as it has that of the members of the Board of Directors, and he carries with him their deep gratitude and affection."

The programme for this year, he said, had been planned to give more diversification than customary. "The routine work and the items pertaining to the business side of our profession are assigned to the morning sessions and encroach upon those of the afternoon only where necessary. The afternoons are left free for the consideration of the æsthetics of architecture, the distinction and the subtleties of style, the relation between architecture, painting, sculpture, and the other arts, while the evenings are devoted to pictorial presentation and analysis."

In keeping with the idea, the afternoon session of the first day, presided over by Mr. R. Clipston Sturgis, a former president, was given to the discussion of the influence of the arts in general, the speakers being Professor George H. Edgell, Dean of the School of Architecture, Harvard University, Professor Sears Baldwin, of the English Department of Columbia, Professor Herbert M. Langfeld, Harvard, and Mr. Jenkins, of *The Atlantic Monthly*. These gentlemen brought a note of special scholarship to the occasion, an engaging sense of humor, and be it said at once a note of unaffected enthusiasm in and for the arts in general.

Professor Langfeld, being introduced as a psychologist, was suspected of being very "highbrow," but, like all the other professors, "he was, first of all, very human." He well said that "in the enjoyment of beauty we must abstract from the general ordinary value of life, and yet it is just this ordinary value of life that is most necessary for our immediate needs. And I think it is for that reason that the reaction to beauty, unfortunately, is relatively rare when we consider all of our reactions throughout the day."

Somehow this dwelt in the mind when later I overheard a delegate in the beautiful galleries of the Corcoran remark to a companion: "I'll bet that not ten per cent of the men here see these pictures, or visit either the Smithsonian or see the beautiful Freer Gallery designed by Mr. Platt, and its priceless contents."

And yet I dare say that no body of men of equal number could be more responsive to the thing we call beauty. We are all so busy with a number of things.

The first evening session was much interested in Doctor C. Howard Walker's discussion of "Tendencies in American Architecture." The tendency is, altogether, evidently a wholesome one, and we are getting rid of a lot of rubbish. We are doing better work to-day than ever. He spoke of the better understanding existing between architect and engineer.

In the afternoon a medal for typography was presented to Frederick W. Goudy.

On the 17th the Fine Arts medal was presented (in absentia) for painting to Mr. A. F. Mathews, and J. Monroe Hewlett gave an illustrated talk on "The Architect's Responsibility in the Development of Industrial Art." "I think the worst charges that can be made against the architectural profession to-day is the rareness with which its members make a hobby of an artistic subject."

There were appropriate remarks made by Doctor Walker on the bicentenary of the death of Sir Christopher Wren.

Election of Officers and Directors

The new officers elected were: President and Director, William B. Faville, San Francisco; First Vice-President and Director, N. Max Dunning, Chicago; Second Vice-President and Director, William Stanley Parker, Boston; Secretary and Director, Edwin H. Brown, Minneapolis; Treasurer and Director, D. Everett Waid, New York; Director, Third District, C. C. Zantzinger, Philadelphia.

Director, Fifth District, C. Herrick Hammond, Chicago; Director, Eighth District, William E. Fisher. Honorary Corresponding Member, Gorham Phillips Stevens.

Membership of the Institute

There were five past presidents of the Institute at the convention: R. Clipston Sturgis, John Laurence Mauran, Thomas R. Kimball, Henry H. Kendall, Irving K. Pond.

The total membership of the Institute on May 16, 1923, was 2,714 (as against a total on June 7, 1922, of 2,484), and was made up as follows:

Fellows	268
Members	2,353
Honorary members	68
Honorary corresponding members	25

Since the last report of the Board there have been:

Elected members	263
Reinstated	3

There have been the following resignations and removals:

Fellows	1
Members	20

There have been the following deaths:

Fellows	3
Members	10
Honorary members	1
Honorary corresponding members	1

The total of new active members elected and reinstated has been 266.

The total number of resignations, removals, and deaths of active members has been 36.

Leaving a net gain in active members of 230.

The following deaths, of which the Institute has record, occurred during the year:

Fellows: George Beaumont, Jos. W. McLaughlin, Leoni W. Robinson. Members: George Edw. Barton, T. E. Billquist, Curtis W. Bixby, Frank M. Duke, Dudley McGrath, George E. Parsons, Frank A. Stearns, William H. Walker, Thomas B. Wolfe, Ernest Woodyatt. Honorary members: James Bryce. Honorary corresponding members: Enrique Ma Repulles y Vargas.

The American Institute of Architects and the Emergency Construction Indictments

The following Preamble and Resolution were adopted by the Board of Directors at its meeting on Monday, May 14:

Preamble: The members of the American Institute of Architects have noted with deep concern the indictments recently secured by the Department of Justice against seven men forming the Emergency Construction Committee of the Council of National Defense, charging conspiracy against the interests of their government and country at a time of national peril.

The indictments involve these citizens in conspiring, in the conduct of their official duties, so as to control the construction programme of the war to their own benefit and the benefit of their friends, thereby obstructing the prosecution of the war and defrauding the government.

Suits are also entered against certain contractors who built many of the large cantonments, such contractors having been selected with the advice of the Emergency Construction Committee, and having executed the work under the form of contract prepared by it.

The type of contract developed by the Emergency Construction Committee, based upon cost plus a limited fee, and its development for the specific purpose of securing excessive profits for

personal or business friends to be selected by the Committee, form the principal bases of the indictment.

In regard to the type of contract, the Board believes it is clearly evident to any one familiar with the building industry that, under the conditions existing at that time, involving extreme indefiniteness in the supply of labor and material, and the necessity for a speed in progress which involved the commencement of work before the completion of the plans that should define its scope, the use of lump sum contracts was impossible, and that the prosecution of such emergency war construction, under the conditions inevitably attendant, could only be secured under the general type of contract that was adopted.

Belief in the justice of the indictments necessitates a belief that a group of men, brought together from various pursuits in different parts of the country, under the pressure of great national need, at a time when a desire for patriotic service was sweeping the country, could have immediately entered into an agreement to use their suddenly imposed responsibilities for their own advantage and could have operated so effectively to this end as to be able to deceive the General Staff of the Army, the Secretary of War, and the Council of National Defense.

The indictments form in effect an indictment of the entire construction industry with all the professional bodies related thereto, since the procedure followed and form of contract adopted by the Emergency Construction Committee were reviewed in detail and approved by a Committee of Investigation composed of the Presidents of three national engineering societies, of the American Institute of Architects, of the General Contractors' Association of New York, the Chamber of Commerce of the United States, and representatives of the American Federation of Labor and Building Trades Employers' Association. These men representing the professional and business organizations of the Building Industry are indicted with the principal defendants in that they are stated to have been appointed for and to have served the purpose of substantiating the actions of the Committee under the guise of an ostensible investigation.

The cases not having yet been brought to trial, and in our code the defendant being innocent until proved guilty, we cannot but affirm at this time our entire confidence in the integrity of purpose and action not only of the Investigating Committee of representatives of national organizations, but also of the members of the Emergency Construction Committee principally concerned in the indictments and the contractors selected by them. Until such time as convictions may be secured, we remain unconvinced that this group of men, under such national conditions as then existed, could conceivably conspire in the manner and for the purposes stated in the indictments.

With this firm conviction in mind, and in the belief that the least consideration that the government can pay to these men is a prompt trial, in view of the immeasurable damage already done to their reputations, which vindication in the courts can only partially retrieve,

Be it Resolved: That the Board of Directors of the American Institute of Architects appeals to the Department of Justice to proceed to the immediate trial of these proceedings, and that it looks with grave suspicion upon any delay in so doing, and that every member of the Institute and of the Building Industry throughout the land be urged to insist and demand, through every avenue of influence that may be available to him, that the trial of these indictments be prosecuted at once, so that the Department of Justice may without delay be challenged to prove the charges it has made.

In Honor of Henry Bacon, the Architect of the Lincoln Memorial

The convention, after all, was chiefly interested in the culminating spectacle that was to do honor to one of the greatest of our architects, and to his creation, the beautiful Lincoln Memorial. It was fitting that this presentation of the gold medal of the Institute should be made something of a national occasion, that it should be bestowed by the President of the United States on the steps of the great monument that adds another superb link in the chain that extends now from the Capitol to the Potomac.

The scene on the evening of the 18th was a memorable one, and in spite of the rain the occasion was brought to a successful and picturesque climax.

All the arts and crafts which participated in raising the vast Grecian pile in memory of the martyred President were represented. "In colorful robes and bearing flares that reflected myriad dancing lights in the quarter-mile-long lagoon which approaches the memorial, several hundred of the country's foremost architects, painters, sculptors, engineers, builders and kindred craftsmen, in two long files on either bank, drew to the steps a barge of honor bearing Mr. Bacon.

"The barge itself was ablaze with slow-burning torches, which, despite a steady drizzle of rain, accentuated its ballooned sail of red and side colors of gold and green. As it rode gracefully down the mirror pool, it seemed a phantom barge of state of olden times returned from the mists. Its approach to the altar raised on the portico, behind which stands the big statue of Lincoln, was heralded with a trumpeted processional.

"Mr. Bacon and William B. Faville, president of the Institute, were met as they debarked by Chief Justice Taft, who presented them to President Harding.

"With the vast temple for a stage, flanked by immense urns of burning incense, Lincoln looked down from his high seat, brought into a hazy relief by a cloud of violet and blue, and saw the President bestow the most coveted prize of the architect.

"Massed upon the steps surrounding were the brightly robed members of the arts, bearing above them a forest of banners embodying symbols of their traditions. Joining with them were the leaders of the official and diplomatic world."

President Harding, in giving the medal to Mr. Bacon, said:

> So, in presenting this testifying medal to you, Mr. Bacon, we would testify also our appreciation and pride in the contributions of those who have been your coadjutors in embodying the substance of ennobling thought, the glory of beauteous conceptions. Out of the crudest materials, you and those who have wrought with you and after you have given us this creation whose simple grandeur has arrested the eyes and thoughts of whoever loves the beautiful and appealing. You have reared here a structure whose dignity and character have won it rank among the architectural jewels of all time. You have brought to your countrymen a swelling pride in the thought that they have been capable of producing such an inspiring theme and such a masterful execution.
>
> Here are typified the qualities which made Lincoln at once the dreamer and the doer, the designer and the builder. That so much of sturdy greatness and of modest beauty have here been brought together is proof that the high inspiration of his life had touched all whose labors contributed to this consummation.
>
> Surely, as we survey it, we may hope that in building the institutions of the nation which Lincoln saved there may be a like fidelity to the ideals which guided him. Each and every one of these who here planned and builded have helped to carve an admonition to such fidelity, such devotion, such faith, as that which showed the way to the great Emancipator.
>
> And to you the further personal tribute of reverent admiration for the pure genius of conception. It is a simple task to absorb or approve, or to modify and apply that which is already created to the fulfilment of our aims and purposes. But it is fine genius which conceives anew, and fashions our sentiments and aspirations into eloquent expression, and makes a new contribution to the richest of human kind. Such has been your triumph, and for it you and your work are honored in all the varied expressions of this befitting testimonial.

By permission of Mr. Cortissoz, art editor of the New York *Tribune*, we reprint, in full, his address made at the dinner given by the Institute in the big tent on the borders of the pool, on the occasion of the presentation of the medal to Mr. Bacon. It is to Mr. Cortissoz that we all owe the dignified and expressive inscription on the wall back of the great seated figure of Lincoln by Daniel Chester French; the noble silent figure in such splendid keeping with the massive dignity of the temple over which he presides.

The Architect

By Royal Cortissoz

This is an occasion having a particularly happy bearing upon the status of the architect in the United States. In honoring a great artist in the presence of his masterpiece, which happens to stand at the centre of our national life, the Institute calls attention to a matter that is of interest to the whole profession—it brings into the foreground the man behind the building. That, you may say, has been done before, but it is really done very rarely, so rarely that the world at large retains, as a rule, small consciousness of the architect as an individual. Do not think I am dealing in paradox. It is truly so, and if you doubt it reflect for a moment on the question of how far the public mind is aware of the architect.

Take the multitudes that travel in Italy every summer. How many people in that vast throng return with the names of Bramante and Peruzzi fixed in their minds as the names of Raphael and Titian are fixed there? Follow them to France. They bring back impressions of Watteau and Fragonard, but do they remember Gabriel and Mansart? Test the average person of culture here at home where our own men are concerned. Does he remember Major l'Enfant, who, though an engineer, is dear to architects because of what he did in the planning of Washington? Does he remember Charles Bulfinch, or Benjamin Latrobe, or John McComb? Not, I venture to say, as he remembers Copley, or Gilbert Stuart, or Sully. And come closer to our own day. Are Richardson and McKim known as Whistler and Sargent are known? The question answers itself.

Unsigned Buildings

There is never any question as to the familiarity of a painter's name or of a sculptor's. For one thing, it goes visibly with their works. But buildings are unsigned and it is seldom that anybody who passes them, not himself an architect, knows who did them. How many people who stop to admire that noble building here in Washington, the Temple of the Scottish Rite, are aware of the fact that it was designed by John Russell Pope? How many people who visit the beautiful newly opened Freer Gallery know, or care to know, that it is the work of Charles A. Platt. And are you sure that the millions who will come first and last to enter the Lincoln Memorial will go away with a lively consciousness of the fact that it is due to the genius of Henry Bacon?

Well, the Institute is doing something to-night to affect that situation, and I stress the point, speaking of it with feeling, for two reasons. In the first place, it is a hobby of mine to advocate the greater honoring of our architects, and this seems an appropriate time and place in which to return to the topic. Architecture has made greater progress than any other of the arts in this country, but for some occult reason the architects seem to hesitate about standing up to be counted, so to say. A painter holds an exhibition of his works. An architect is content to send a few photographs to the annual show of the Architectural League. To do any more than that appears to him to risk the stigma of "advertising." Pray, are we "advertising" Henry Bacon to-night? Are we not rather honoring ourselves in honoring him and saying to the world: "Here is a man who has built one of the nation's greatest monuments"?

Then I allude to this phase of the subject, too, because I have a vivid sense of what we owe to certain men in the architectural profession; men who had character and put it into their work, men who were leaders, men whom we should realize and hold in remembrance as we should Henry Bacon. It was my good fortune to observe in my youth the beginning of the great modern revival of American architecture, and I have been watching it ever since. I have seen its unpayable debt to sheer individuality. There was Henry H. Richardson, a powerful driving force. I remember my friend John La Farge telling me that everything Richardson did had to be on a large scale. If he drank anything—water, milk, champagne—there had to be a huge pitcher of it. He built that way. Look at Trinity Church, in Boston, or the public buildings he did for Pittsburgh. They bear the impress of a magnificent personality.

The Human Element

It was so with Richard M. Hunt, all fire and energy. It was so with McKim. The other night I was marooned in the Pennsylvania Terminal for an hour by the deadly conflict between daylight saving time and real time, and I spent it in saturating myself anew in the beauty of the building. I studied the grandiose scale of the thing, its immense proportions, the gigantic arches, the bases twenty feet high, the heroic mouldings. And I fell to thinking of the purely human traits behind it all—of McKim's courage, his self-confidence, his strong affirmative qualities in pondering those immensities on paper and then telling the craftsmen to go ahead and translate his vision into stone. McKim seemed to me a very real and near presence in that moment.

The human element is very near to us in architecture. Character comes before scholarship. It goes everywhere into the making of a great building. If you will permit me for a moment I would like to recall an aspect of the subject that is sometimes overlooked. Looking back to those days in which a new heaven and a new earth in American architecture were ushered in, it is not alone of McKim and of White that I think, but of some of the men who worked for them. I think of John Sarre, a house painter who was truly an artist. I think of Joseph Cabus, a cabinetmaker, who kept going the best tradition of an ancient craft. I think of plump, smiling Edward Tompkins, the marble man, for whom a properly finished job was as essential as breathing. They had character, those men, like the architects who led them, like Henry Bacon to-day.

If I had to characterize Bacon in two words I would call him an embodied conscience. A homely little story that came to me not long ago will enforce the point. It was told to me by the president of the university where Bacon was asked to design a fraternity house. He made the plans, and when the committee was through poring over them they said they wanted big, plate-glass windows. The plan called for small panes, and these, the committee said, would have to be changed. Bacon said: "It is necessary to the integrity of my design that the panes should be small. If you must have them large the affair is very simple. Give me back my plans, employ some one else, and we'll call that little matter settled." The panes went in small.

The Lincoln Memorial

You see it was not a little matter, after all. Nothing has ever been a little matter with Bacon, nothing that touched the honor of his art. He has built many buildings, studying all manner of problems. He has designed bank buildings and university dormitories, libraries and hospitals, churches and schoolhouses, a railway station and an astronomical observatory, a public bath and a bridge. In collaboration with our leading sculptors, with the late Augustus Saint-Gaudens, and with Daniel C. French, he has designed perhaps threescore monuments. And in everything he has done he has been that embodied conscience of which I have spoken, seeking perfection. How nobly he could grasp it the Lincoln Memorial shows us.

There never was a more profoundly considered design. That building was studied, and restudied, and restudied again. Its smallest detail, as well as its mass, represents ceaseless meditation. And here I would emphasize once more the man behind the building. What is the style of the Lincoln Memorial? A natural reply would be: "The style of ancient Greece." But for my own part I would prefer to call it "the style of Henry Bacon." The great principles of the Lincoln Memorial, its majesty, its strong refinement, its simplicity, its beauty, its monumental serenity, you will find running through the entire long procession of Bacon's buildings. We must call him, I suppose, a classicist, but he has made the classic idiom absolutely his own and gives to his designs a superb individuality.

Henry Bacon's Masterpiece

He has given it to the Lincoln Memorial, the culmination of his art, and there are other things in this masterpiece on which I would briefly pause. Think of what he has done for the country in making it so beautiful! Sooner or later most of our people will contemplate this building, and from it they will take away an impression certain to discipline and enrich their taste. And think finally of the deeper thing Bacon has done in placing his gifts at the service of those people. By some happy coincidence there are thirty-six columns enclosing the memorial, corresponding in number to the States that Lincoln knew in the last year of his life. Around his memory they stand on guard. The whole building stands guard, and, with it, the whole people. Bacon had more to do than recreate the type of the antique Greek temple. Scholarship could do that. He had to express the spirit of calm settled fidelity in which the millions of the United States stand by the name and fame of Abraham Lincoln. Has he not, like the poet, risen to the height of his great argument? Has he not stated, in enduring beauty, the faith of a nation in an immortal leader?

Editorial and Other Comment

The New York Woodpecker

A FRIEND from Boston in New York recently stopped on Fifth Avenue to exchange the greetings of the day, and found it hard to make himself heard on account of the reverberating clatter of a riveting-machine near by. When he finally got in a word or two he remarked that our "New York woodpecker" was expressive of the city. It was forever in a state of rattle and excitement, the old ever making room for the new.

A look about town just now makes this fact unusually evident. Buildings are going up with surprising speed, and the money invested in them in these days of high labor and material costs must be something large, even with long rows of figures always before us. Among the many buildings are a number of new apartments below 14th Street that have displaced old residences of some pretensions to historic interest. The building of these apartments means a gradual unheaval of about the only part of New York that has any flavor of the past, and it is evident that with the passing of the old brownstone houses will come a new and different social element.

Statue of Lincoln. J. B. C.
By Daniel Chester French in the Lincoln Memorial.

It seems to be a fact that there is no limit on what people can afford or will pay for conveniently located and comfortable apartments.

The architecture of some of the new apartments is, at least, inoffensive, but now and then, in the desire for ornament, a façade is spoiled and vulgarized by the overuse of colored terra-cotta out of keeping with the general design.

We need more color and cheerfulness in our architecture, but we need with it the good taste that makes it an agreeable and harmonious relief, not a bit of frosting stuck on a hunk of dough.

They do this thing well in Holland and Belgium, and the Italians have long led the way.

There has been a well-considered use of color in some of the recent alterations of old houses, and some of those designed by Mr. Sterner are noticeable. Too much color or color badly placed on our buildings is much like the ill-considered application of the lip-stick and powder-puff. Discretion in all things, we should say.

A City of Pyramids

IN the last show of the Architectural League in New York, there were some large drawings of the city of the future as a predicted result of modern zoning laws and the setbacks of the new skyscrapers on their aspiring way upward.

Harvey Corbett, one of the architects of the beautiful Bush Building, on 42d Street, gave a most interesting talk on the city of the future. The writer remembers visiting Mr. Corbett's office several years ago and looking at the small paper model of this building in the process of being designed. The architect pointed out to me the changes that he proposed and that were made obvious by new parts adjusted to the original model. You could study every detail in little and visualize the completed structure in a way that no drawing could possibly present.

This use of models has been a practice of many architects for some time, and in no other way can the prospective client really form any definite idea of what his architect is doing. The building is shown in detail, including the various materials to be used and the effect of contrasting colors.

It was Mr. Corbett who said that our sky-line of the future will be one of "colossal steps."

There are many new buildings going up and many a passer-by stops to look up at the great steel cages of their framework and wonders at the way they diminish and go backward from the street-line as they ascend.

We look with casual interest, though, upon pretty much everything in the way of building, and no longer wonder at either height or mass, but yet these great structures are tremendous achievements and involve a degree of skill and expert knowledge little short of the miraculous.

We are but following the builders of ancient Babylon, whose ziggurats or holy mountains (our modern skyscrapers) were terraced, and reached by gradually ascending ramps instead of express elevators. "Babylon or Babel was as amazing in size as constitution. Streets running parallel to the river were crossed by others at right angles," and the famous hanging gardens were, probably, the great white way of the time.

A Great Honor to the Profession

THE ceremonies attending the recent presentation of the gold medal of the American Institute of Architects at Washington were a great honor to Mr. Bacon and as well to the profession he so ably represents. It was fitting that the President of the United States should make the presentation on the steps of the beautiful temple over which presides Mr. French's great statue of Lincoln. On other pages of this number will be found a report of the convention held at the Corcoran Gallery and an account of the evening pageant at the Lincoln Memorial.

The High Cost of Financing

WE hear constantly all about the high cost of labor and the high cost of materials, but only those who are on the inside know or stop to figure the high cost of financing building.

Some of the facts make interesting reading, and we are indebted to a *Monthly Digest of the Common Brick Industry* for the following illuminating figures:

"The word 'profiteer' has come out of many of the conferences held, and it always is hurled at labor and the material man. The facts are that brick is selling at practically the same price in every part of the country to-day that it did a year ago to-day, and this in spite of a demand which is far in excess of the supply in many centres.

"In all of the publicity given to construction in meetings both local and national, little has been said about the cost of financing. Simply stating a fact, without comment or criticism, it may be said that one of the chief items of expense in connection with building is the financing. In many large apartment operations to-day the money costs 20%. That means for every $1,000,000 borrowed for the operations, only $800,000 actually goes into land and construction. The interest rate may be 6% or 7%, but this 20% is a 'bonus' or gift to the institution furnishing the money, which is not represented by a single brick or an ounce of steel. Similar rates apply in the building of a home. A man who would borrow $10,000 for the erection of a residence will probably pay not less than $600 as a bonus for a three-year to five-year loan. In other words, he makes a present of $600 to the financing concern for the privilege of loaning him money at 7%. He pays interest upon the full $10,000 during the period of his loan, but he actually never received $10,000. He has placed to his credit only $9,400, and he must invest considerable of his own money in the lot and the early stages of construction before he receives a dollar of his loan. It may be six months or nine months before all of the loan has been paid to him, but he is paying 7% upon $10,000 throughout the operation. A man who would build a $20,000 home must charge up against the operation certainly not less than $1,000 for financing, which is not represented in the building by a single brick or a shingle. The cost of financing a home, whether it costs $5,000 or $50,000, is greater than the subcontract for labor and material, in roofing, in electrical work, or in heating. It is greater than the cost of the brick, generally speaking, and next to woodwork and carpentry, which is always the largest item, this bonus for financing is the largest individual item in the table of costs."

But in spite of the high cost of everything we are inclined to agree with those who can't see any particular benefit to be derived from a stoppage of work. The only solution lies in a competitive labor market, and evidently there are not enough skilled workmen to meet the present demand. Labor, however, bears its full share of the high cost of its own work as well as the rest of us.

Architectural Polychromy

From an Address by C. Howard Walker

IN regard to polychromy, which means many colors, there are definite objections to the use of many colors upon the exterior of buildings, for several reasons.

First, building is an entity, a complete and adequate organism, and its expression should be one of unity. Factors, therefore, which would tend to minimize this expression by introducing a confusion of statement are inadvisable.

Such confusion would occur from the introduction of many colors, unless there were a marked domination of one color. Therefore, a general tone and a dominant color serve best to give harmony to the general effect. The introduction of polychromy, *i. e.*, many colors, should be minor and accessory and devoted to intimate details which should accent but not disturb the general effect.

There were at first but two reasons for the use of color. There was little or no intention to beautify objects by its use, it was protective as with birds and insects merging into the background and inconspicuous, or it was later a picture-book, a record of events, simply representative with an attempt at natural coloration. As it was to be read as a record, it was in zones read from left to right upon the walls and upon the columns in Egypt, and led eventually to the hieroglyph, the alphabet, and finally to written language, by which time the superposed zones, having lost their purpose, had disappeared. In all respects the forms and their color were literal and representative, as far as was possible without a knowledge of either light and shade, shadow and perspective. The colors were of local coloration, even and flat. The ceilings of the Egyptian temple are the deep blue of the heavens, studded with stars. The plants of the river, the lotus and papyrus, and the palm appear in the flutes of the columns and in the bud and bell capitals because these columns were at first made of the reeds, and the record is painted in their natural colors upon the stucco-covered stone. The colors are intense, partly because they are oxides of copper, burnt earths, and cinnabar, but also because shadows are deep and dense and the detail would have been lost were it not in intense color, which clarified it and gleamed from the shadows.

Around the columns and upon the pylons the figures, which are colored the brown of the bronzed actual figures which they represent, record the occupations of the Egyptians, the ceremonies of the temple and the wars of the king and his armies going out to the far-flung boundaries of the realm. They are the great picture-books of the time.

All Egypt was a picture-book and each moulding was decorated with symbols which told a story. A background had been provided upon which the record gleamed, a page upon which was displayed definitely each object and symbol, and no background could be better for this purpose than one that was white. Therefore, the Egyptian covered his brownstone temples of the South and the limestone mastabas of the North with the Egyptian white earth, the stucco, and created a tradition which was followed by the Greeks.

The mouldings were painted with repeated symbols. To Osiris, all the plant forms coming from the earth, that mysterious realm of the dead and of the God, were dedicated and appeared upon his temples.

Polychromy, therefore, either literally or symbolically told the story of the land upon a white background, which became almost a necessity, for it was always related to religious buildings and expressive of the highest ideals of the people, and the tradition was maintained and extended to Phœnicia and to Crete, where it met the work of Mesopotamia and was carried to Greece.

The most beautiful buildings were white and their colors were purer and clearer and perceptible at a greater distance than were other combinations of color. The clarity was very marked, but the pigments were permanent only in lands where rain was rare.

NORTH FRONT, WILMINGTON PUBLIC LIBRARY, WILMINGTON, DEL.

Edward L. Tilton and Alfred Morton Githens, Associated Architects.

Shrubbery against the base not yet in place.

ENTRANCE DOORWAY, WILMINGTON PUBLIC LIBRARY, WILMINGTON, DEL.

Edward L. Tilton and Alfred Morton Githens, Associated Architects.

The carved decoration is entirely behind the natural face of the jamb-stones and lintels.

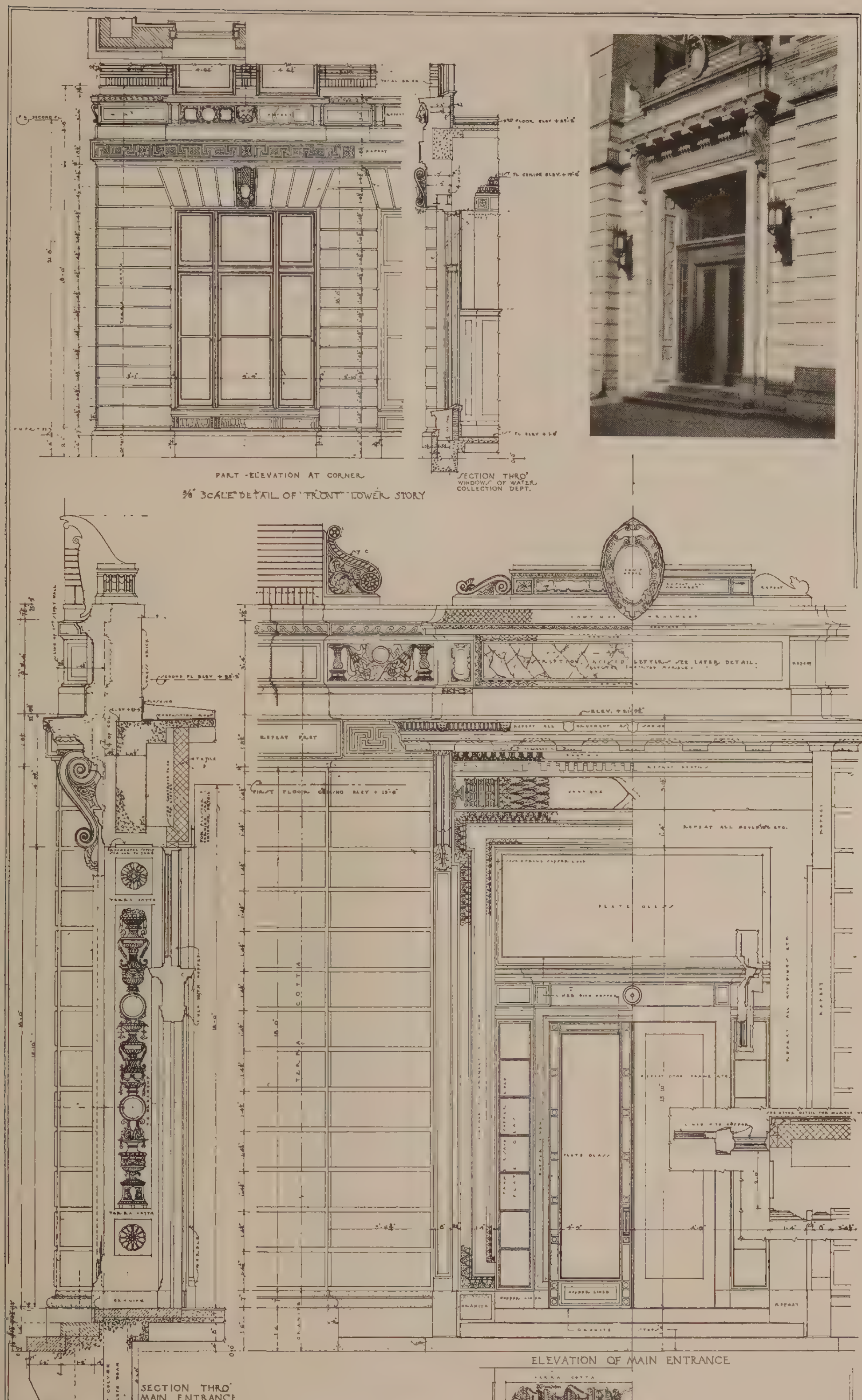
DETAIL, WILMINGTON PUBLIC LIBRARY, WILMINGTON, DEL.

Edward L. Tilton and Alfred Morton Githens, Associated Architects.

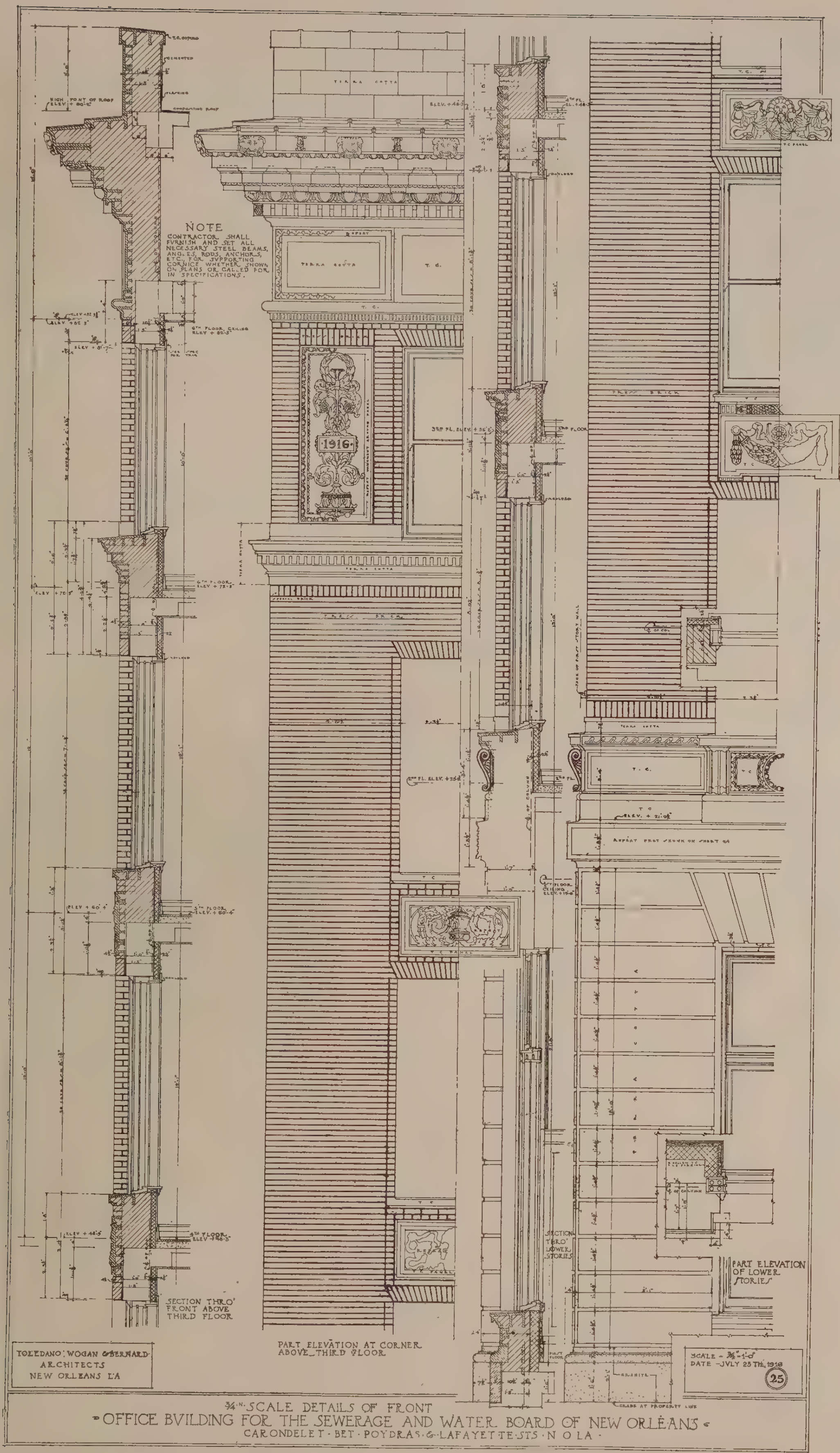
ENTRANCE-HALL TOWARD THE EAST STAIRWAY, WILMINGTON PUBLIC LIBRARY, WILMINGTON, DEL.

Edward L. Tilton and Alfred Morton Githens, Associated Architects.

Pompeian decoration in strong colors.



Toledano, Wogan & Bernard, Architects.



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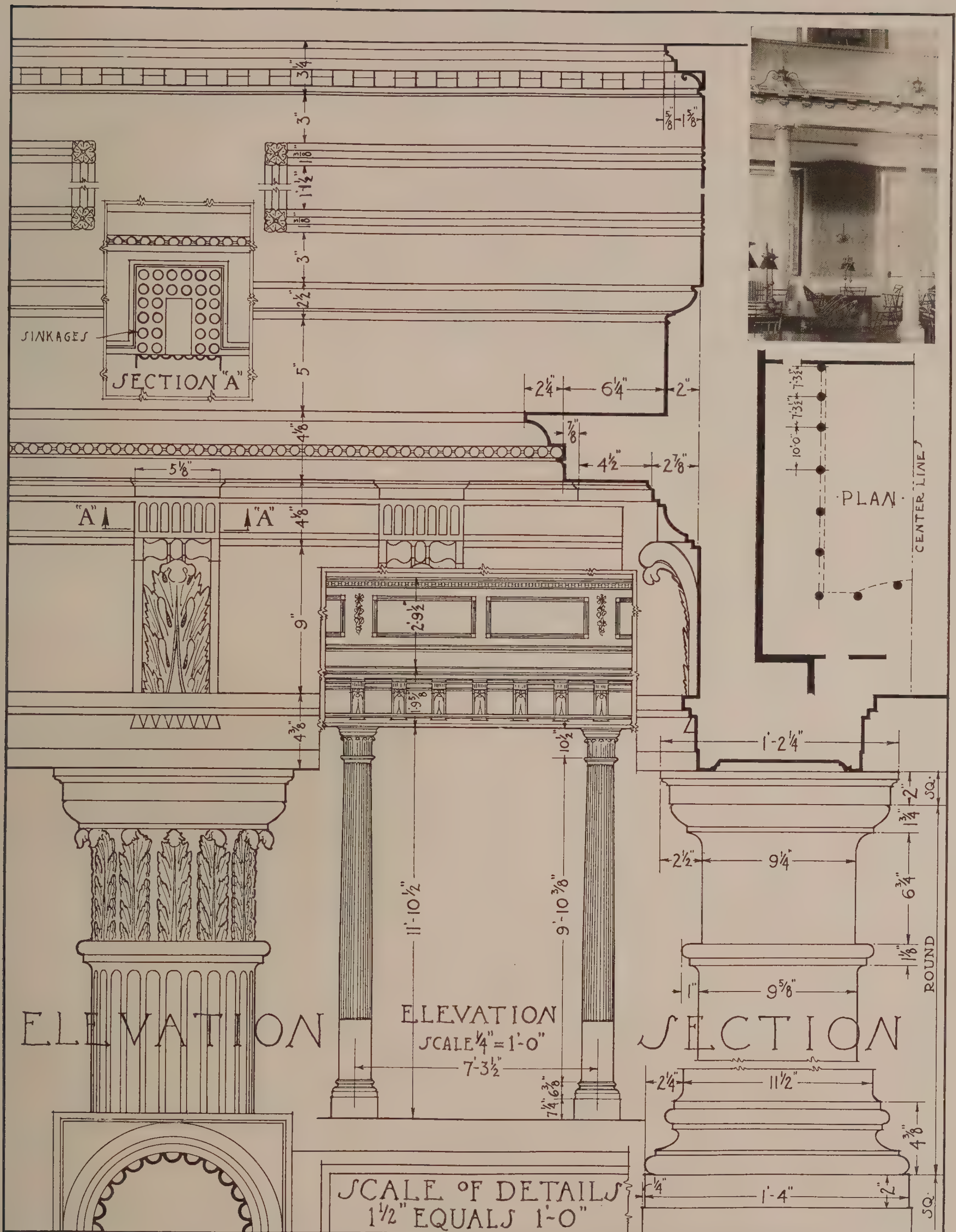
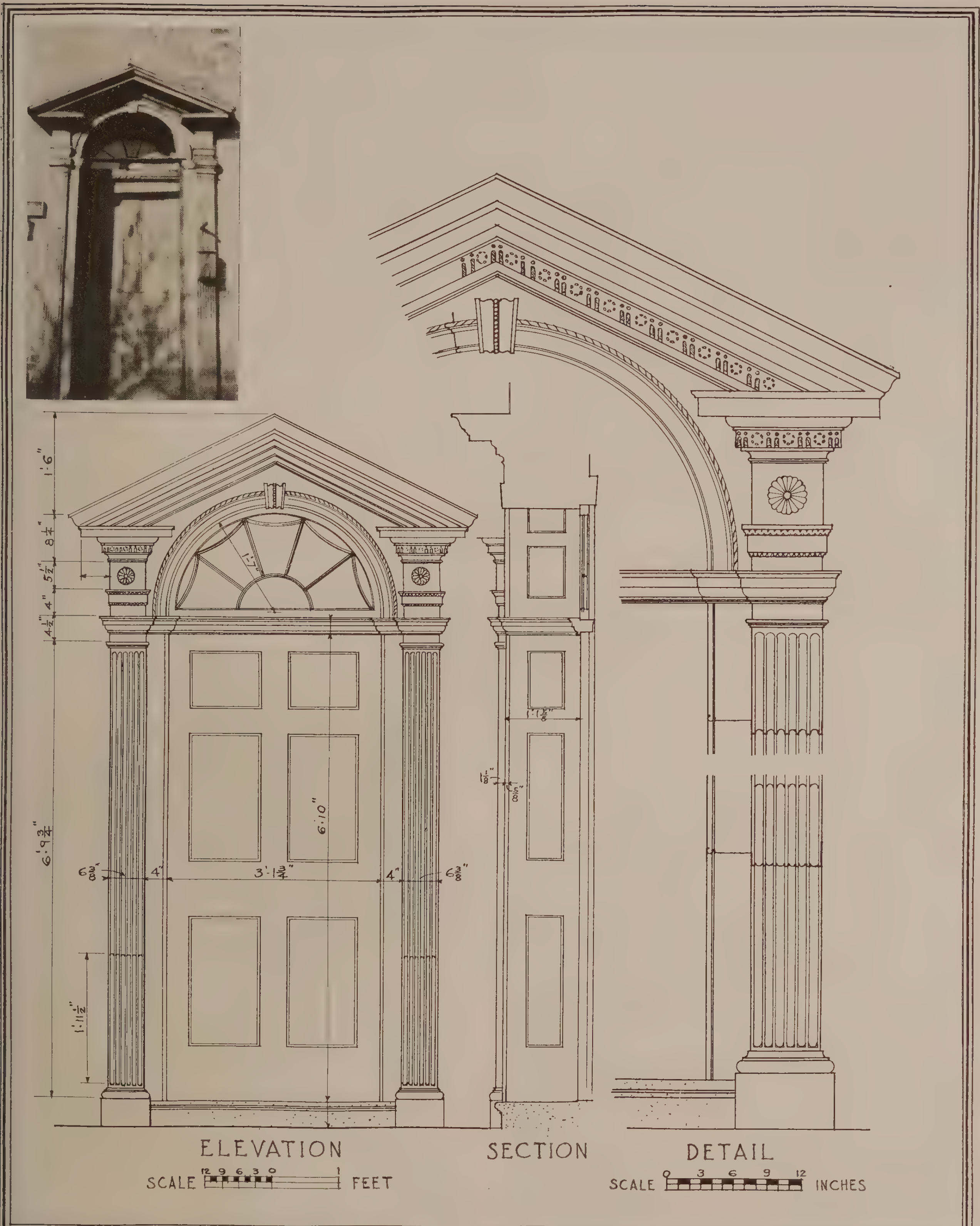


BOSTON COLONIAL SERIES

- DETAIL OF BALCONY -
- WEST CHURCH - - BOSTON MASS -
- BUILT IN 1806 - - NOW USED AS BRANCH OF BOSTON PUBLIC LIBRARY -

MEASURED AND DRAWN BY G·R·MITCHELL

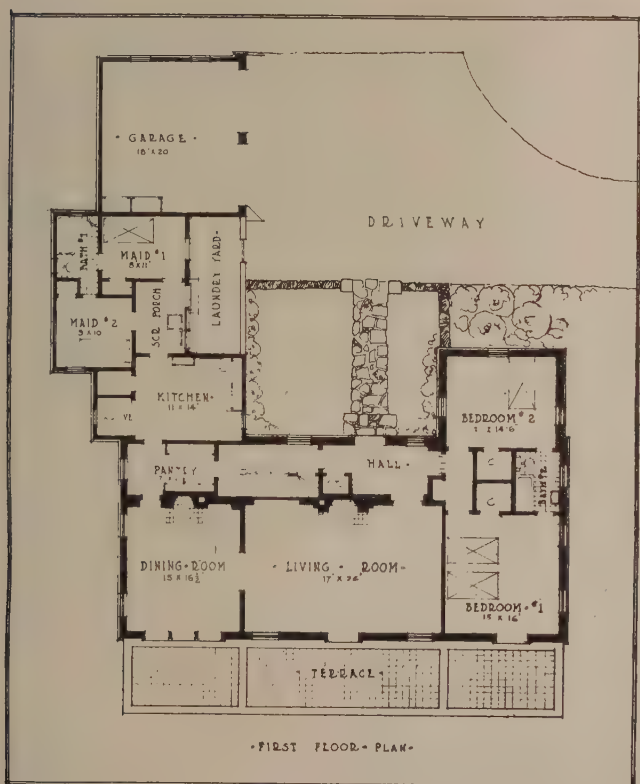


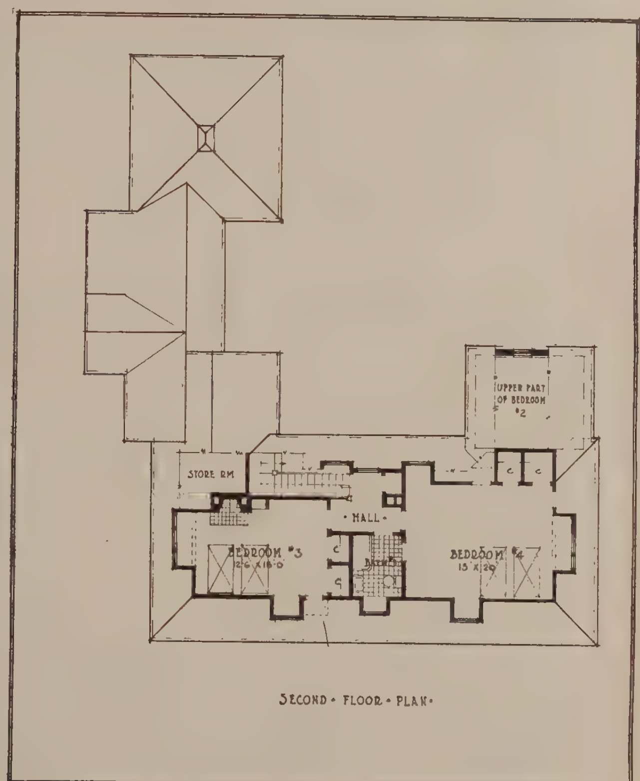
· COLONIAL · · ARCHITECTURE · OF THE DISTRICT *of* COLUMBIA	· DOORWAY · · 2029 · E · ST. N.W. WASHINGTON, D.C. · · CIRCA · 1800 ·	· MEASURED AND · · DRAWN BY · · ALBERT P. ERB ·

"LE PETIT MANOIR," RESIDENCE OF F. L. BAXTER, POMAR LANE, MONTECITO, SANTA BARBARA, CALIF. Soule, Murphy & Hastings, Architects.

Awarded Certificate of Honor, single dwelling, Class B, seven to twelve rooms, in 1923 Exhibition of the Southern California Chapter, A. I. A.

PATIO.

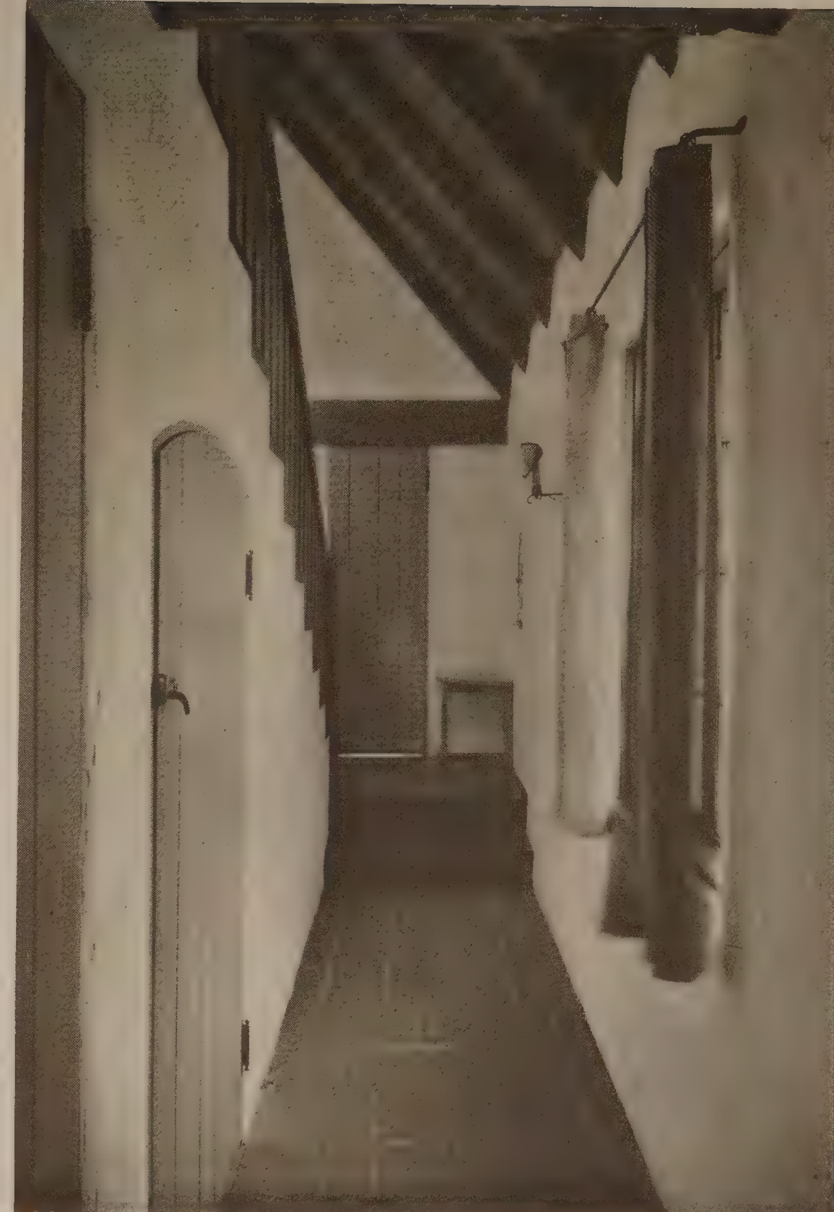




"LE PETIT MANOIR," RESIDENCE OF F. L. BAXTER, POMAR LANE, MONTECITO, SANTA BARBARA, CALIF.

Soule, Murphy & Hastings, Architects.

DETAIL.



STAIR-HALL.

Soule, Murphy & Hastings, Architects.

"LE PETIT MANOIR," RESIDENCE OF F. L. BAXTER, POMAR LANE, MONTECITO, SANTA BARBARA, CALIF.

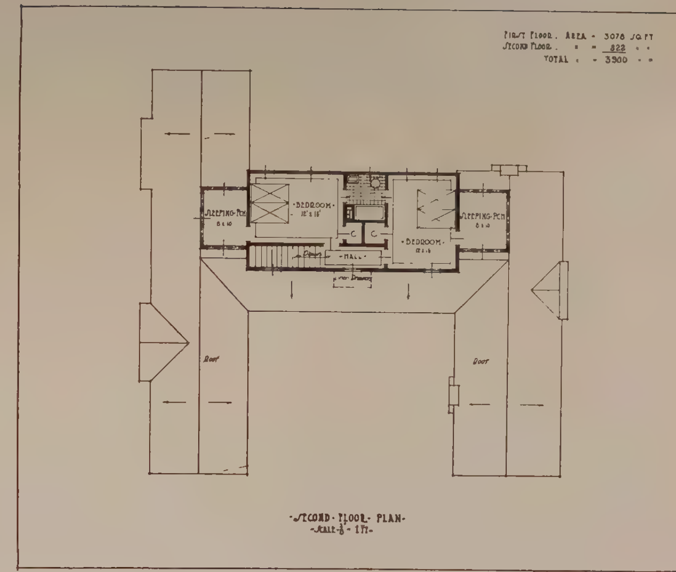
ENTRANCE FRONT, RESIDENCE, W. S. SPAULDING, MONTECITO, SANTA BARBARA, CALIF.

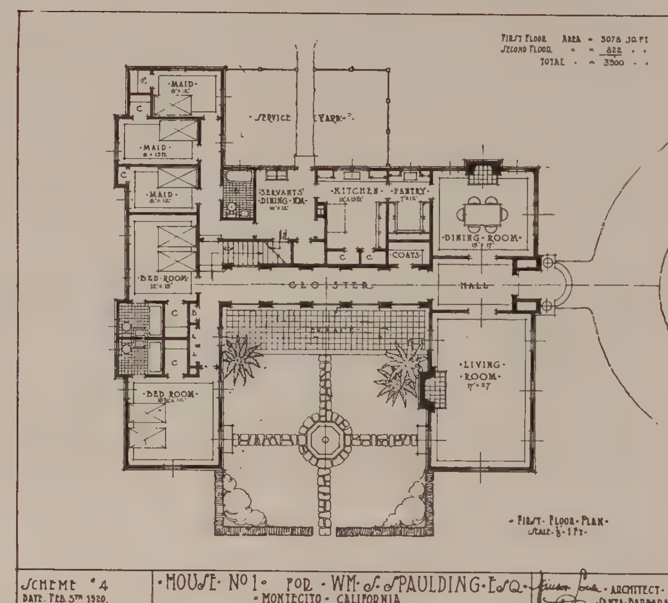
Soule, Murphy & Hastings, Architects

GARDEN FRONT, RESIDENCE, W. S. SPAULDING, MONTECITO, SANTA BARBARA, CALIF.

Soule, Murphy & Hastings, Architects.

DETAIL IN PATIO, RESIDENCE, W. S. SPAULDING, MONTECITO, SANTA BARBARA, CALIF.



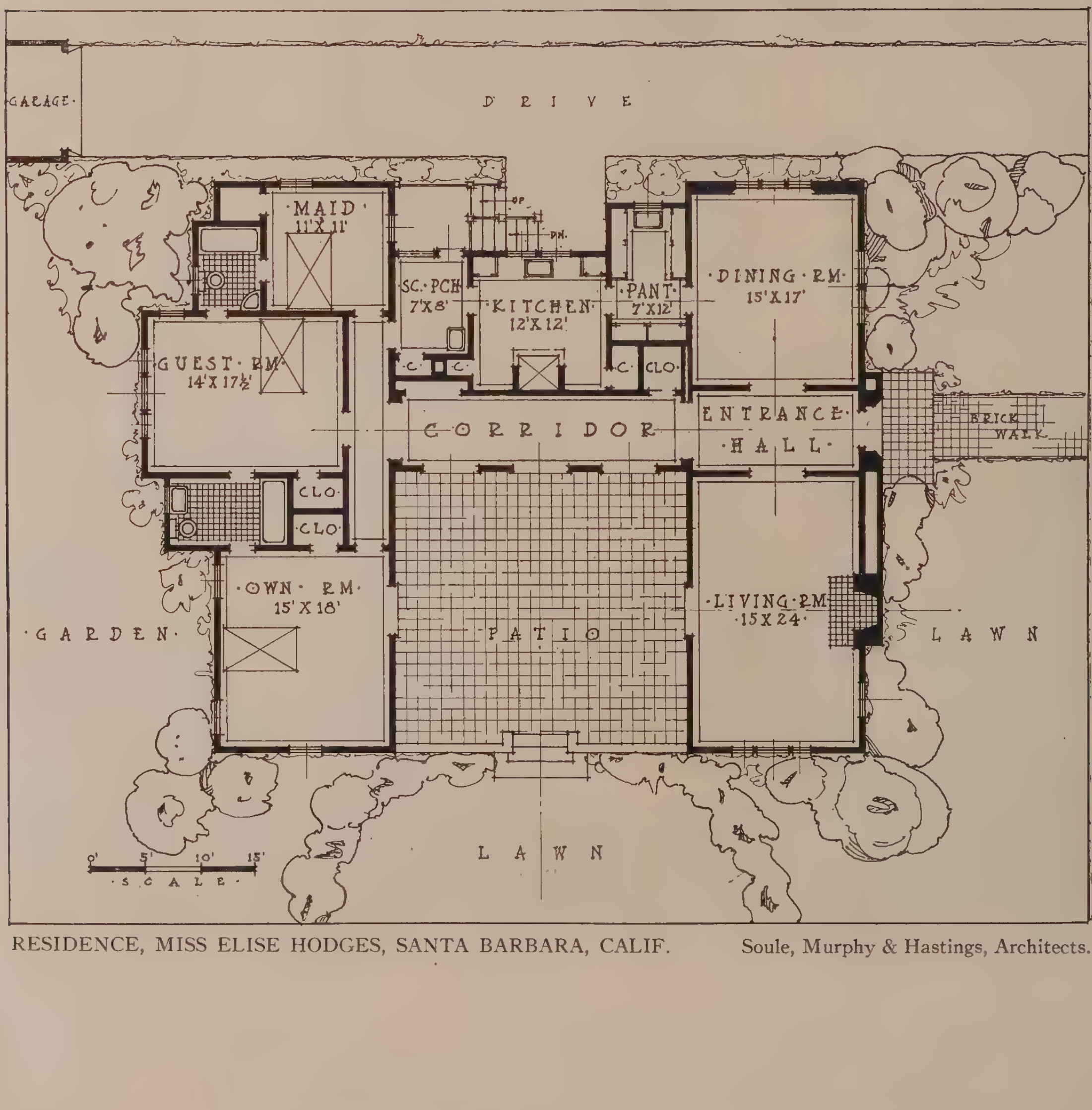


Soule, Murphy & Hastings, Architects.

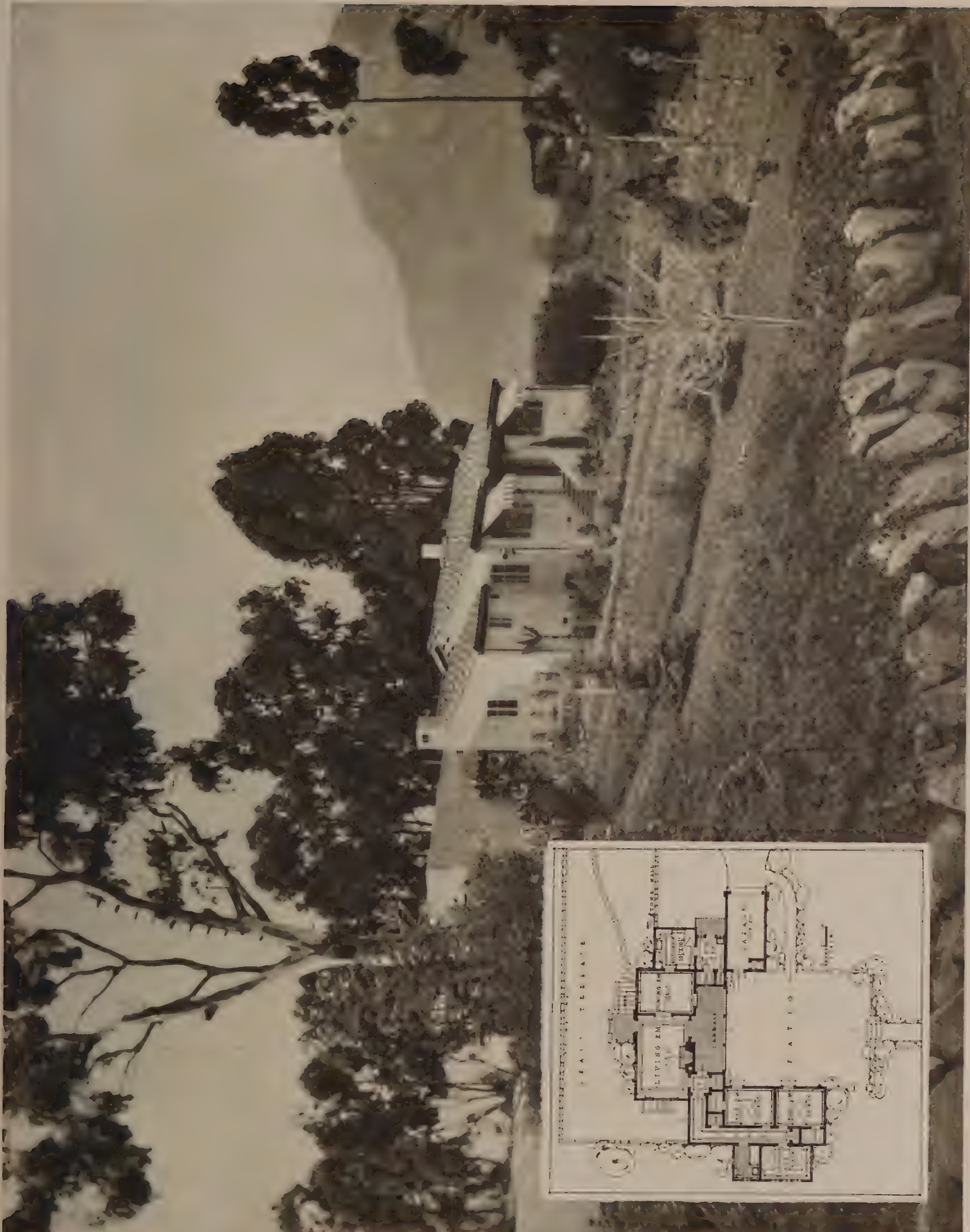
RESIDENCE, MISS ELISE HODGES, SANTA BARBARA, CALIF.

Soule, Murphy & Hastings, Architects.

PATIO.

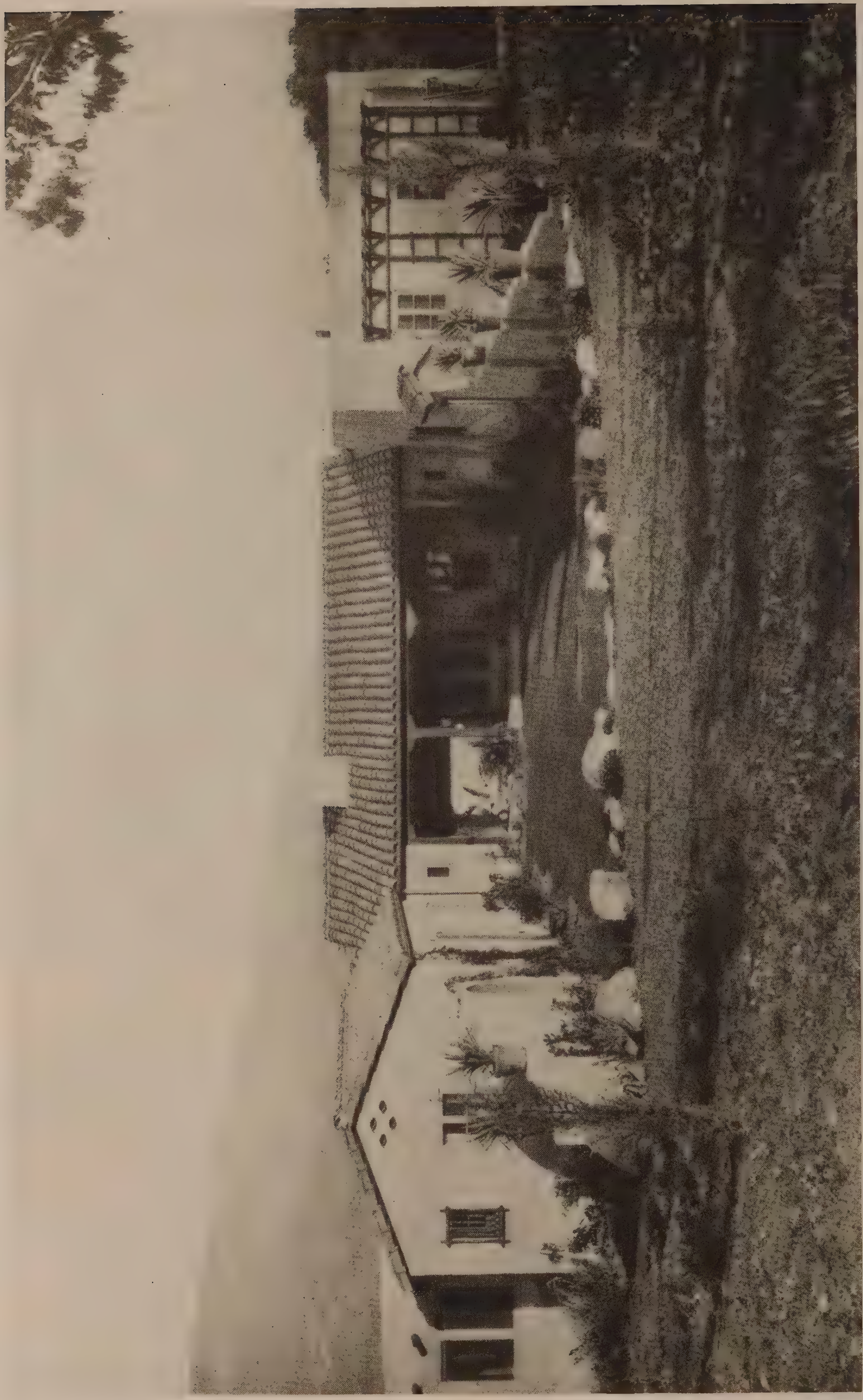


RESIDENCE, MISS ELISE HODGES, SANTA BARBARA, CALIF. Soule, Murphy & Hastings, Architects.



Soule, Murphy & Hastings, Architects.

RESIDENCE, ELEANOR M. SEMMELMEYER, SANTA BARBARA, CALIF.



PATIO, RESIDENCE, ELEANOR M. SEMMELMEYER, SANTA BARBARA, CALIF.

Soule, Murphy & Hastings, Architects.

General Surgical and General Medical Group.

The Medical Group at the University of Virginia

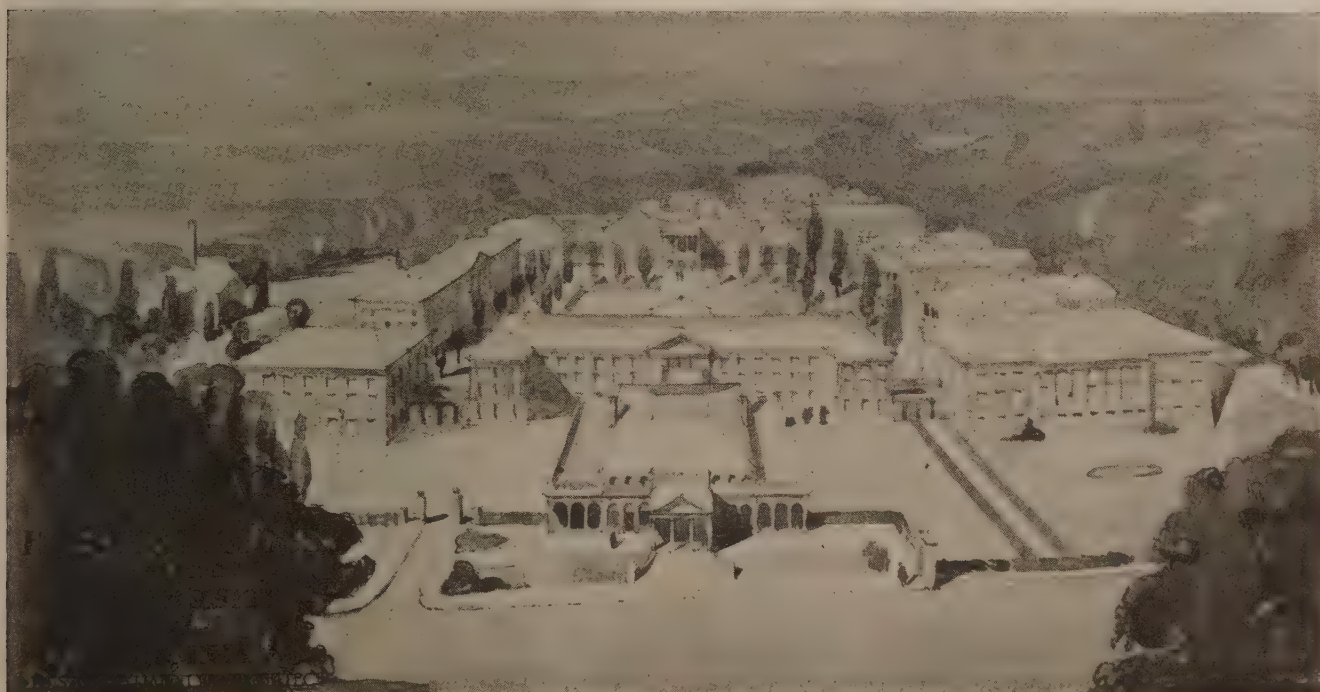
A Study for Development

Fiske Kimball, Architect

THE gift by Paul Goodloe McIntire of funds for a new wing of the University Hospital, and the imminence of further growth in the Medical School and Hospital, led the rector and visitors of the university, in the summer of 1922, to commission a study of their ultimate architectural development.

The scope of desirable expansion was first carefully considered by the medical authorities, who also prepared detailed schedules of the requirements for each department. The following statement from Dean Hough gives a general outline of those future educational needs in medicine and allied subjects which determine the main lines of the building programme:

"The medical group of buildings should first of all bring into intimate relation with each other the laboratory and the clinic, and the clinic should provide for outpatient and ward work. It should provide facilities for instruction in medicine proper; in dentistry, which is now on a university basis; in preventive medicine, or public health; and in pharmacy. It should also provide for a school of nursing. The schools of medicine and of nursing call for adequate hospital facilities, while dentistry, preventive medicine, and



Medical and Hospital Buildings for the University of Virginia. Entrance Building in Foreground.

The medical school.

pharmacy find their clinical facilities in the outpatient departments. The approximate physical needs of these branches of medicine as a whole may be outlined as follows:

"1. *School of Medicine.* This would wisely provide for entering classes of 100 students and graduating classes of 80–85 students. The laboratories of the school should also provide for instruction in the medical sciences of students of dentistry, preventive medicine, and pharmacy. This means laboratories of anatomy (including histology and embryology), biochemistry, physiology, bacteriology, pathology, and pharmacology. It also calls for hospital departments of surgery, internal medicine, pediatrics, obstetrics, a psychopathic building, a building for contagious diseases, a nurses' home, and a service building for the whole group. Finally, second to no other building in importance, is the outpatient building, which should not only house the entire outpatient work, but also provide facilities for diagnosis and for many special forms of treatment.

"2. *School of Dentistry.* This school should accommodate entering classes of 50 or even 75 students. The fundamental sciences would be accommodated in the medical laboratories which may also provide rooms for training in the technical procedures of dentistry. The main dental operating-rooms should be in the outpatient building. Dentistry should be in the most intimate possible relation with medicine.

"3. *School of Preventive Medicine,* especially adapted to the training of health officers and sanitary inspectors for the rural health work of the State. In addition to the contacts which this school will have with medicine, dentistry, and sanitary engineering, its relations with the Blue Ridge Tuberculosis Sanatorium in Charlottesville and the large summer school of the university are to be considered.

"4. *School of Pharmacy.* In many States, including Virginia, graduation from a recognized school of pharmacy is a prerequisite to licensure as a pharmacist. The State university is best prepared to give this instruction. A school of pharmacy is also helpful to the work in medicine and dentistry, and is operated most efficiently in connection with these schools, as well as in connection with general, analytical, and organic chemistry, and with botany, in the academic department of the university.

"5. *School of Nursing.* This should not only be provided in connection with the hospital of the medical school, but should also offer training in public-health nursing."

The tract immediately reserved for the medical and hospital group comprises some fifteen acres, adjoining the university on the southwest. Here stand already four hospital pavilions in a line parallel to the main university group, the general chemical laboratories, and, at the extremity of the plot, the main heating and power plant, on its spur track. In general, the intention has been to extend the hospital southwestward, by additional pavilions, and to place the medical laboratories in a second line, beyond.

For the practical problem of arrangement and interconnection, the key of the solution devised is the placing of the diagnostic and outpatient building between the two lines on the threshold of the plan, and its use for all incoming and outgoing patients. The existing "Entrance Building" of the university is utilized to provide the main waiting-rooms. Farther on, the general-service building occupies a similar intermediate position, constituting the fourth side of a principal quadrangle. Beyond are the contagious and psychopathic pavilions and the nurses' building. In the hospital, as at present, the ground floor is assigned to colored patients, the upper floors to white patients.

Every patient, whether or not he expects to receive hospital treatment, will first pass the diagnostic clinic. For those able to walk entrance is by the north portico on the centre line of the whole group, fronting directly on the main

avenue of approach with its street-car line and automobile parking space. For ambulance patients there is a separate carriage entrance under cover. Both open on the centralized admitting office, in close connection with the general administrative offices of the hospital. On the two main floors are numerous examination and treatment rooms; on the ground floor the emergency department; on the upper floor the dental clinic with unobstructed north light. Patients who prove to require hospital treatment proceed to the proper pavilion by covered connecting corridors.

The main hospital as shown comprises nine pavilions with an estimated bed capacity about as follows:

	WARD	PRIVATE ROOMS
Medicine	100	25
General surgery and gynecology	125	40
Genito-urinary surgery	30	14
Orthopedics	40	15
Obstetrics	50	20
Pediatrics	50	14
Eye and ear	30	14
Skin and syphilis	25	8
Total	450	150
	150	
Total	600	

In addition to these there are the separate contagious department and the psychiatric building. Both of these, like the main hospital pavilions, are served from the main kitchen through basement corridors.

The service building, of which the kitchens form a part, provides separate dining-rooms for the resident staff (50), for the nurses (225), and for the servants (150). On the top floor are living quarters for the internes.

The nurses' building, although immediately adjacent to the service building, and having covered connection through this with the hospital, turns its back on these and has its own forecourt on the Fry's Spring road. Privacy and ease of access are thus alike insured.

The Medical School proper comprises five pavilions or wings, of which the central one contains the school administration, the library and general lecture-rooms, the others respectively the departments of physiology and biochemistry, pharmacology and materia medica, anatomy and histology, pathology and bacteriology. These wings may be extended eastward as required.

All told, the scheme provides for twenty-one buildings, of which seven are already standing, another now begun. The cost of the others will depend on price levels prevailing at the time the work may be undertaken. Should costs descend again to the scale of March, 1922, they might be obtained for $2,000,000.

In the architectural composition of the buildings, the Jeffersonian traditions of formal planning at the university have been followed. A complication was threatened here by the position of the existing entrance building, which, without adequate motive, had been placed out of square with the other university buildings. By frank acceptance of this inclination, and its duplication on the other side of the centre line, as in a number of foreign groups, this difficulty was overcome. It was even turned into a merit, since the practical requirements demand that the diagnostic building, at the base of the triangle, should be longer than the service building farther in. So too the differences of level existing on the site have been turned to advantage in the creation of terraces surrounding the main quadrangle.

While, owing to the diagonal streets bounding the university tract on the east, it is not possible to unite the university and hospital groups by any major axis of symmetry, there are nevertheless important minor axial connections. Both the centre of the whole line of hospital pavilions, and the centre of the surgical group fall on the old lanes leading down from the lawn. Thus on the east as well as in the new gymnasium development on the west, the wonderful university group, unique in America, bids fair to grow without loss of its essential harmony.

Section through Group.

Insulation and Fuel Economy

THE best time to save fuel is when you build your house, not when a fuel shortage develops or when the mercury hovers around zero, according to H. J. Burt, structural engineer with Holabird & Roche, architects. And the way to save your fuel is to see that your house is properly insulated.

"For each pound of fuel consumed in heating a house there is produced a definite number of heat units," says Mr. Burt. "These ultimately escape to the outer air. The longer these heat units can be retained within the building the smaller the amount of fuel that will be required to make up their continual loss.

"Heat is lost up the chimney and around the doors and windows. These escapements give a natural ventilation, but the loss of heat by transmission through the walls and roof is wasteful and should be corrected by the application of an effective insulating material.

"The average difference in temperature in the northern half of the United States is approximately forty degrees in the winter. The amount of coal required to supply the heat loss for the above case is eleven tons. By moderate insulation of these walls one-fourth of this loss can be prevented, and by thorough insulation the saving increases to one-third or one-half.

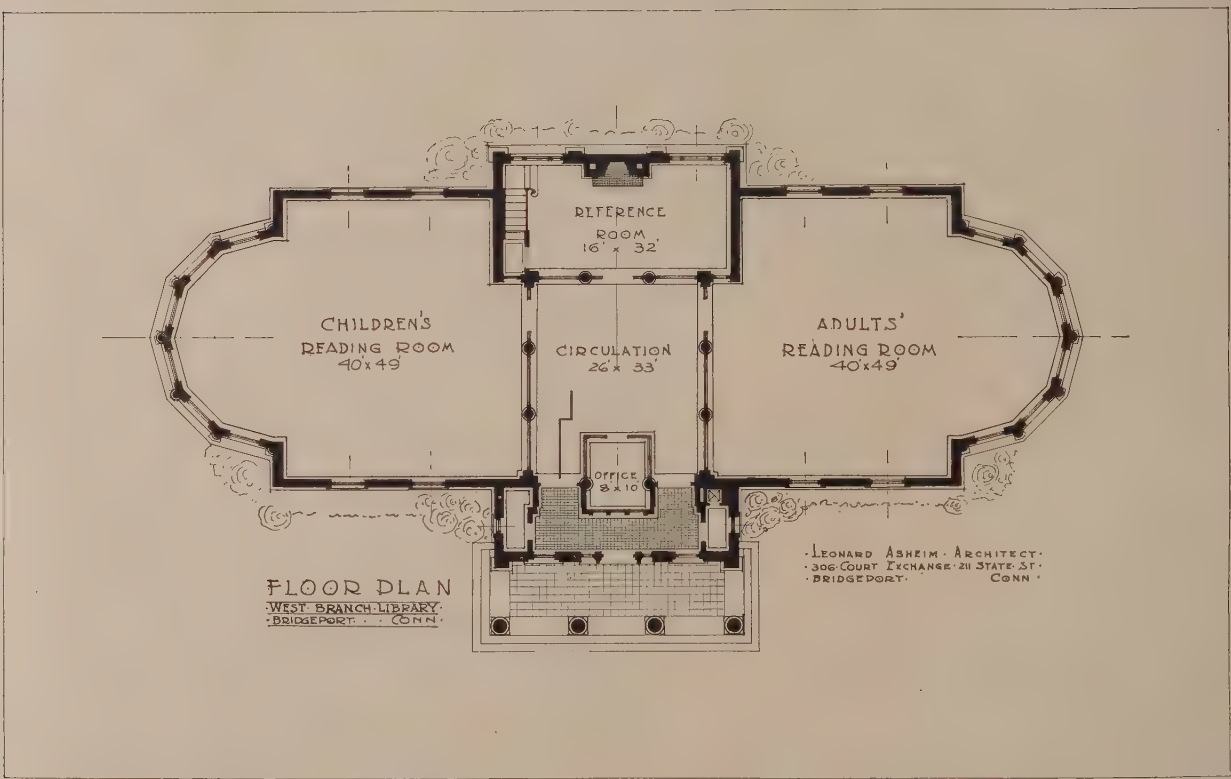
"Roofs are even more extravagant than walls in the loss of heat. The ordinary shingle roof will transmit 50 per cent more heat than the ordinary side wall. The insulation of roofs proves proportionately more effective."

WEST BRANCH LIBRARY, BRIDGEPORT, CONN.

Leonard Asheim, Architect.

The West Branch Library was contracted for in July, 1922, and cost $60,000; 31 cents per cubic foot. The building contains two reading-rooms, reference-room, circulating space, office, and public toilets on the first floor. There is a fireplace in the reference-room. The mezzanine floor contains reference-room and stock-room. The basement contains staff-room, locker-room, public and private toilets, work-room, and a lecture or assembly hall (40 by 49 feet). Constructed of common Eastern brick, with copper roof.

REAR OF BUILDING.



WEST BRANCH LIBRARY, BRIDGEPORT, CONN.

Leonard Asheim, Architect.

CIRCULATION AND CHILDREN'S ROOMS.

REFERENCE-ROOM.

Leonard Asheim, Architect.

WEST BRANCH LIBRARY, BRIDGEPORT, CONN.

Announcements

Lang, Raugland & Lewis, architects and engineers, announce their removal from 627 Metropolitan Bank Building to 412 Essex Building, Minneapolis, Minn.

Wood & Bradney, architects, have changed their address to 70 Andrews Building (formerly the Builders Exchange Building), Buffalo, N. Y.

Walter G. Memmler, 300 Watkins Building, 228 3d Street, Milwaukee, Wis., announces the opening of office at the above address, and will be glad to receive catalogues.

A. H. O'Brien, architectural engineer, wishes to announce the removal of his office to 1210 March-Strong Building, Los Angeles, Cal.

W. L. Stoddart, architect, announces the removal of his office to 50 East 41st Street, New York City, May 1, 1923.

The firm of Lane, Davenport & Peterson, architects and engineers, are now occupying their new offices, Suite 1017, 1018, 1019, 1020, and 1021, Charlevoix Building, corner Park Boulevard and Elizabeth Street, Detroit, Mich.

Francis Y. Joannes, architect, Robert C. Dunbar and Henry C. Hahn, associates, announce the removal of their offices to the Park-Lexington Building, 247 Park Avenue, New York City, May 1, 1923.

Michael A. Cardo, architect, announces the removal of his office to 405 Lexington Avenue, New York City.

R. G. Schmid & Co., architects, announce the removal of their offices to Suite 1410, 1412, 1414, 1416, and 1417, The Chicago Temple Building, southeast corner Washington and Clark Streets, Chicago, May 1, 1923.

Ellicott R. Colson and Harry F. Hudson announce that the firm of Colson-Hudson, architects, was dissolved May 1, 1923. Mr. Colson will open an office at 91 Dun Building and Mr. Hudson will retain the present office at 34 Dun Building.

Robert J. Reiley, architect, 50 East 41st Street, New York City, announces that on May 15, 1923, he removed his organization to larger quarters at the above address, where he will continue the general practice of architecture.

J. Ed. Overbeck, architect, Suite 519, Wilson Building, Dallas, Texas, announces the removal of his office from 1209½ Main Street to Suite 519, Wilson Building, Dallas, Texas.

H. I. Feldman and Horace Ginsberg, architects and engineers, have removed their executive offices from 17 West 42d Street to the Pershing Square Building, Park Avenue and 42d Street, New York City.

Having purchased the interest of Mr. C. W. Way in The C. W. Way Co., Marcus L. Evans, Brandes Building, Hastings, Neb., wishes to announce that he will continue the practice of architecture at the same location.

York & Sawyer, architects, after May 1, Pershing Square Building, 100 East 42d Street, New York City.

Book Reviews

THE SPIRIT OF AMERICAN SCULPTURE. By Adeline Adams. Written for and published by the National Sculpture Society.

We wish that the spirit, sense of proportion, and humor that are so delightfully manifested in this little book might be injected into more of our art criticism.

As an inspiring introduction to the study and a guide to the things worth while in American sculpture, this book is unique. It is something besides a treatise on sculpture; it humanizes and vitalizes the topic and makes it one of fascinating interest. We wish it could be put into the hands of every student of American art. It gives an adequate impression of our sculptural beginnings and of the men and women who have placed American sculpture in the high place it now holds.

Written in the nature of a handbook for the outdoor exhibition of the National Sculpture Society on the beautiful grounds of the Hispanic and other museums at Broadway and 156th Street, it assumes all the value of a general review of the subject. Art would have a much wider interest for readers in general if those who write of it could take a leaf or two out of Mrs. Adams's methods. Here are no affectations of language or technicalities to confuse the uninitiated.

Of course, Mrs. Adams does not tell us about Herbert Adams, one of the men to whom we owe so many beautiful things, but the publishers have inserted a note of well-deserved comment.

DETAILS OF THE ARCHITECTURE OF TUSCANY. Photographs and Text by Harold Donaldson Eberlein. Measured drawings by Oliver Reagan, with a frontispiece in color and over 100 plates of photographs and carefully measured drawings, reproduced at an exact architectural scale, with many profiles in full size. William Helburn, Inc., New York.

This handsome and beautifully illustrated volume contains much new material, or heretofore only available in expensive publications.

The details shown include loggias, mantels, stairs, doors, rustication, ironwork, woodwork, balustrades, well-heads, gate-posts, brick floors, tile roofs, chimney-tops, etc.

Florence is a city beloved by artists and architects alike, and the material offered there is an unceasing source of inspiration to all concerned, either in architecture or the arts of design.

THE SIGNIFICANCE OF THE FINE ARTS. Published under the direction of the Committee of Education of the American Institute of Fine Arts. Marshall Jones Co., Boston.

Architecture, of course, includes all of the arts, and it may be laid down as a general principle that the greater the interest of the architect in the allied arts, the greater the architect.

After all is said regarding the technicalities of any profession, there always remains the element of the intangible, the things of the imagination, without which mere technical skill is but a cold and lifeless formula.

It was the thought of the Committee on Education of the American Institute to make a book "that should be useful as a text-book in American colleges and for general reading by the public, with the purpose of arousing interest in the fine arts and creating a better understanding and appreciation of them." A worthy purpose, and we hope that this interesting general survey of the arts, each chapter written by a specialist, will serve its purpose and be made use of in many colleges and schools where, we are happy to observe, the fine arts seem to be coming more into their own.

"Art exercises an important influence in the formation of character." Never a truer commonplace, and there is no influence that we need more to counteract the gross materialism that seems more than of old to submerge and ignore the influences for better living and thinking that even a little knowledge of the fine arts might help to soften.

Here is a book written "in simple language and with the absence of complicated theoretical discussion" that may shed its light in many shadowy places.

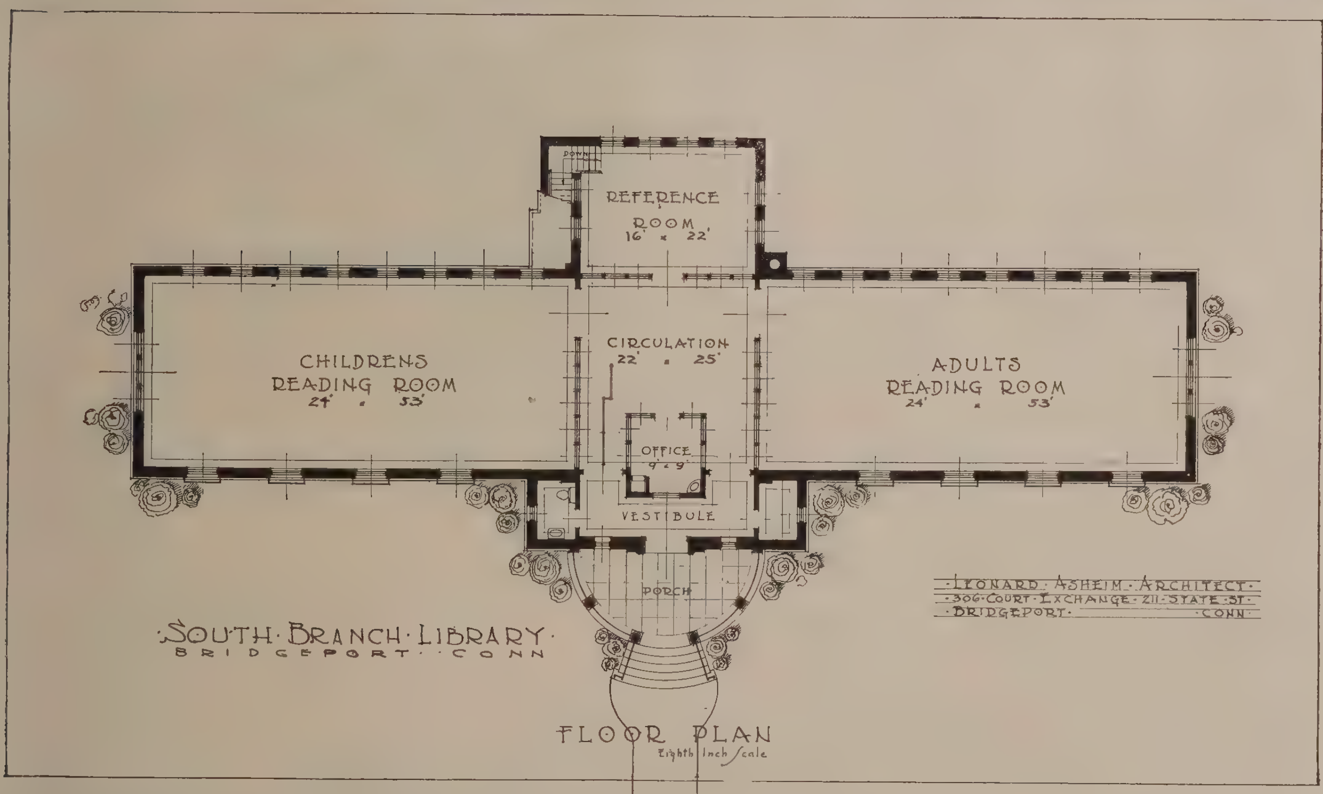
The chapters and authors are as follows: "Classical Architecture," by C. Howard Walker; "The Architecture of the Middle Ages," by Ralph Adams Cram; "The Renaissance," by H. Van Buren Magonigle; "Modern Architecture," by Paul P. Cret; "Sculpture," by Lorado Taft; "Painting," by Bryson Burroughs; "Landscape Design," by F. C. Olmstead; "City Planning," by Edward H. Bennet; "The Industrial Arts," by Huger Elliott; "Music," by Thomas Whitney Surette.

In a book of this kind much matter is necessarily crowded into a little space, but with a judicious appreciation of the fact that the first purpose of the book is to create an interest, and this it does effectively. The reader or student who cares to pursue any particular subject further will find a helpful bibliography at the end of each chapter.

The volume is well illustrated, and the type of a clear and readable size. There are two editions, one intended for the library, the other as a text-book—both containing the same material.

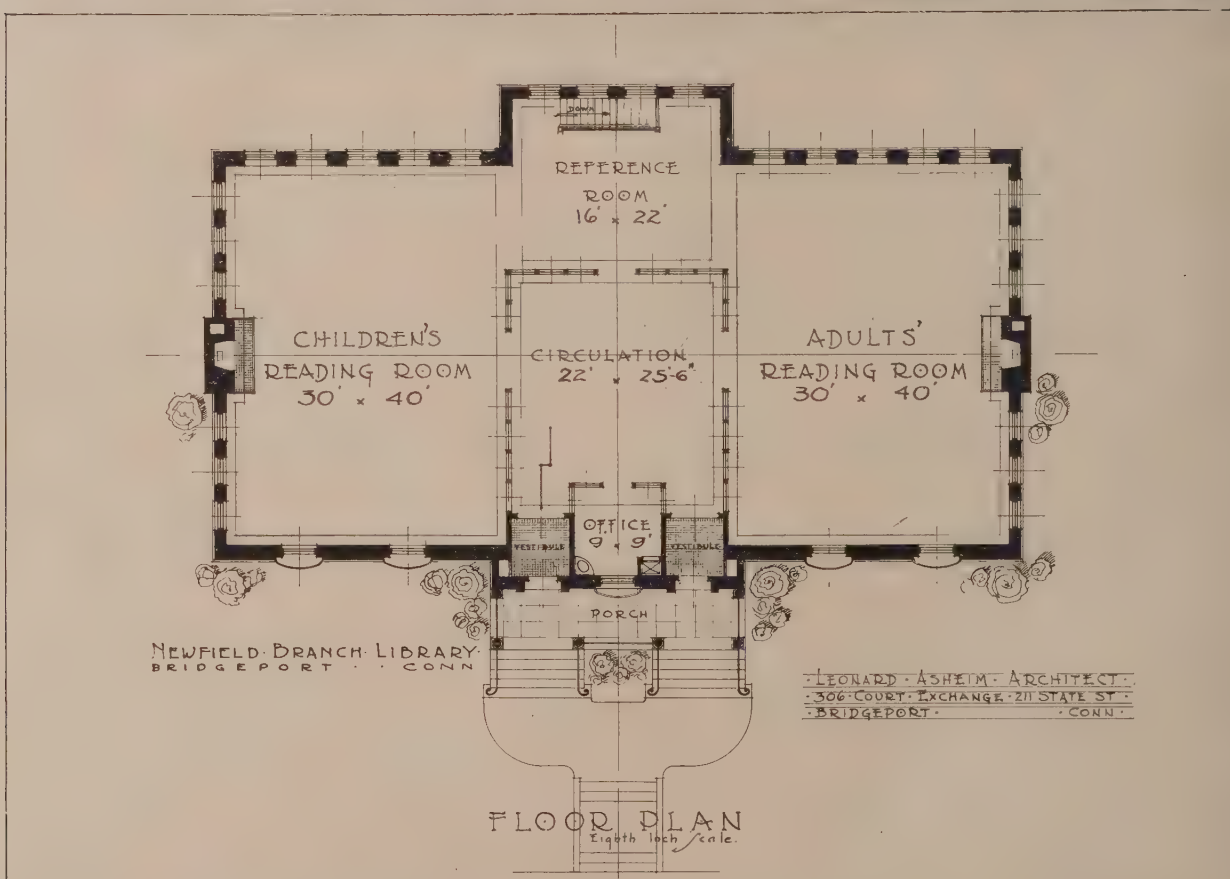
If the volume is primarily meant to awaken the lay mind, we can also recommend it to the profession as a broadening influence, "for the student of art sees visions," and even the professional man at times is in dire need of "visions."

The Committee on Education of the Institute includes: C. C. Zantzinger, chairman; Donn Barber, Arthur Brown, Jr., Charles Butler, William Emerson, William B. Ittner, Ellis F. Lawrence, George C. Nimmons, Thomas E. Tallmadge.



SOUTH BRANCH LIBRARY, BRIDGEPORT, CONN. Leonard Asheim, Architect.

The South Branch Library was contracted for in August, 1921, and cost $32,848.55; $0.286 per cubic foot. The building contains two reading-rooms, reference-room, circulating space, office, and work-room, and public toilet on the first floor. The basement contains staff-room, locker-room, private toilets, and lecture or assembly hall (24 by 48 feet). Constructed of common Eastern brick, with tar and gravel roof.



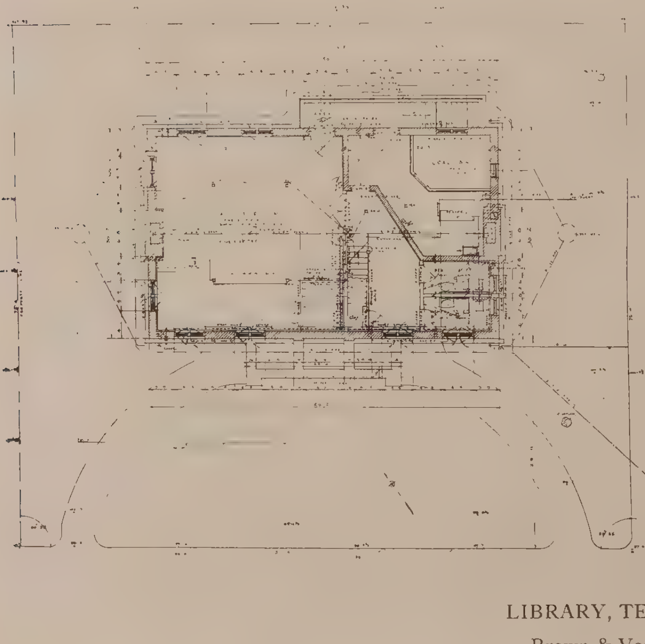
NEWFIELD BRANCH LIBRARY, BRIDGEPORT, CONN. Leonard Asheim, Architect.

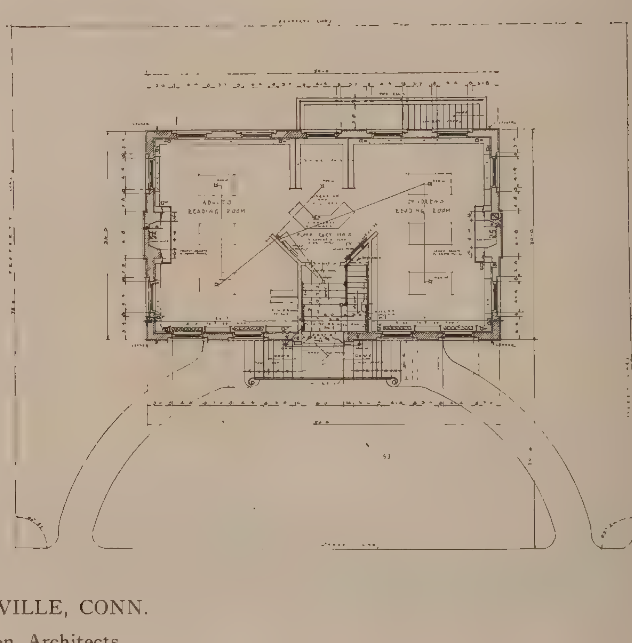
The Newfield Library was contracted for in August, 1921, and cost $34,838; $0.27 per cubic foot. The building contains two reading-rooms, with fireplace in each, a reference-room, circulating space, and office on the first floor. The basement contains staff-room, locker-room, private toilets, work-room, and a lecture or assembly hall (39 by 42 feet). Constructed of Philadelphia pressed brick, with slate roof.

LIBRARY, TERRYVILLE, CONN.

Brown & Von Beren, Architects.

READING–ROOM.





LIBRARY, TERRYVILLE, CONN.

Brown & Von Beren, Architects.

How the Parthenon Was Planned

Modern Theory and Ancient Practice

By William Bell Dinsmoor

ARTICLE II

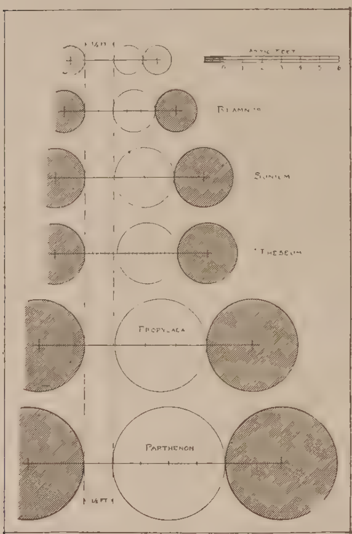
WHAT, then, was the method employed in the design? During an investigation of the problem extending over more than a dozen years, I was forced, in spite of myself, to see that the method adopted was hardly different from that of modern times. I find no mystery in the plan of the Parthenon, nor in that of any other Greek temple; I have no secret to disclose. For there is a man who tells us practically how it was done; his name is not unknown to you—in fact, his fame has recently been made notorious. He is the man whose writings, more than any other single influence, caused the revival of classic architecture; the man whom all modern architects, directly or indirectly, have adopted as their master; the only ancient writer who has transmitted to us ancient architectural traditions—Vitruvius. To me, it seems necessary only to define the changes of fashion which had evolved during the four centuries between Pericles and Augustus, a development which I hope some day to trace. And therefore you may imagine my amazement when, on returning to this country, I was met with the statements that "Modern research has entirely discredited Vitruvius. Not a single Greek example has been found which bears out the Roman writer's theory. . . . No building has been found which in any particular conforms to his rules. . . . The Vitruvian method of studying Greek proportions . . . has long since been abandoned as a hopeless failure." And some have even regarded his book as a forgery of the fourth century A. D., or even of the tenth century. The unity of Homer, the accuracy of Pausanias, issues raised and settled —surely these examples should warn us against doubting the veracity of Vitruvius.

The Human Scale in the Doric Order. (Drawing by E. Brune.)

In other words, it has become a modern tendency to dispute the implicit statement of Vitruvius that he worked out his system with the assistance of the theoretical writings of the Greek architects, which he cites by title, dating through all the centuries from 546 B. C. to his own time. Why we are now so ready to discredit him, I do not know. He says plainly that the buildings were laid out on the basis of the foot rule; the surviving Greek specifications and expense accounts give the measurements plainly in feet and fractions of feet; and with all this evidence my analysis of the buildings agrees. Yet the modern advocates of geometrical solutions say: "It appears that the buildings of the Greeks defy any system of measurement in length. . . . Since the time of Vitruvius attempts to analyze Greek proportions have generally been based on units of linear measurement. And every one will admit that the results obtained—whether the unit experimented with was a Greek foot, or a modulus taken from the object analyzed—have been meagre, and for the most part unconvincing." That is all true. But we must not allow our judgment to be biassed by the fact that modern investigators have persisted in employing the wrong kinds of feet; in my study of the Propylæa at Athens, for instance, I noted attempts to analyze its design on the basis of five different lengths of the foot, whereas its architect, Mnesicles, of course employed only one. We have only to remember that no Greek used the pseudo-Greek foot of 12⅛ inches; that the mainland Greeks used the Attic foot of 12⅞ inches; and that the Asiatic Greeks used the Ionic foot of 11⅝ inches, which was by them transmitted to the colonies of Magna Græcia, and thence to Rome. It is my thesis that the Greek architects worked entirely with proportions based upon linear measurement; and I must ask you to believe that all the measurements hereafter quoted have been faithfully transformed into Attic feet of 12⅞ inches (327 millimetres).

And what are the other despised precepts of Vitruvius? For one, he tells us that columnar buildings were designed with reference to the full lower diameter of the column. Now some of our critics argue that the fundamental dimension is really the mean diameter of the column, at more than half of the height; others claim that the diameter has no connection with the basic design at all; however, during sixteen years I have been unable to find a Greek lower diameter which does not work out simply in Greek feet and fractions of feet. Again, Vitruvius tells us that the spacing of columns was determined with reference to the column diameter, by means of simple ratios. Here again his statements are verified in every respect, so that the axial spacings, like the column diameters, work out simply in Greek feet and fractions of feet. Furthermore, he tells us that small mouldings are proportioned from larger members, again by ratios, but now the dimensions are so small that it is a question of using not feet and inches but rather a full-sized templet; and this seems to be the only explanation of the sizes of the

smaller members of the Greek orders. And finally, Vitruvius tells us that the ratios of spacing, of height, and of all other details, varied in accordance with the actual size, or the scale, of the building. But one noted authority* writes of Greek buildings: "Between the destination of the members and their size all connection is broken; there exists nothing which gives a building its 'scale.' . . . Freed from every tie with things that measure, they suggest no idea of absolute size, nothing but a perception of relations, an impression of harmony." And another† does not hesitate to say: "Among the Greeks . . . a small monument is hardly more than a reduction of a great one, and a great monument is an exaggeration of a small one." If he could hear this, Ictinus would turn in his grave.



The Doric Intercolumnar System.

The mere fact that the buildings of Ictinus and his contemporaries do not follow the proportions of Vitruvius is no reason for discrediting Vitruvius; for fashions and formulæ varied in the course of four centuries. But the principles remained constant.

The plans of large and important buildings, throughout the world's history, have never come into the world full grown, like Athena from the head of Zeus; always have they been the result of innumerable adjustments and compromises. And thus, to take even so simple a case as a Greek peristyle, it was never possible to start out with a preconceived formula and to translate it directly into stone. The architect might start from the approximate width desired for his façade; but from this, just as Vitruvius prescribes, he obtained the column diameter, and, after adjusting the column diameter so that it might be easily dimensioned in feet and fractions of feet, he worked back again to obtain the final width of the façade, which always varied slightly from the original estimate. Or, on the other hand, he might be building with second-hand material, which gave him his column diameter at the very beginning; and then again the width of the façade was not a dimension that could be exactly foreseen, but a matter of growth.

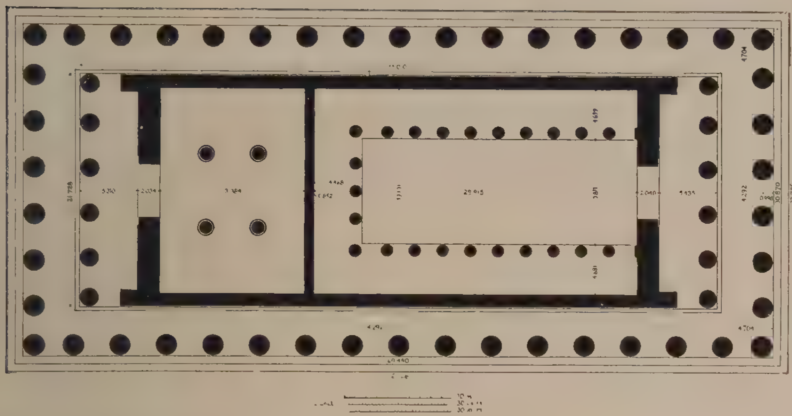
When Ictinus and Callicrates were appointed architects of the Parthenon, in 447 B. C., the site at their disposal was already occupied by the ruins of an earlier structure, the Older Parthenon. This older temple was the creation of Aristides and Themistocles; it was begun as a memorial of the battle of Marathon; but before its columns had risen more than a few feet above the platform, the Persians came again, stormed the Acropolis, and burned the unfinished temple with its incasing scaffolding. Now it was in this ruined plan that some nameless architect had developed the newly evolved principles of fifth-century Attic architecture; and the preservation of some of these results was favored by Ictinus. He was inspired, furthermore, by motives of economy; or perhaps it was that the superintendents said to him: "The irate Themistocles has already, as you perceive, carried off a large part of the calcined material, and built it into the north wall of the Acropolis, as a reminder of the destruction of his cherished plan. But here still remain numerous step blocks, wall blocks, and column drums of three diameters, $5\frac{5}{6}$ Attic feet, $5\frac{1}{4}$ feet, and $3\frac{5}{12}$ feet, as well as masses of freshly quarried material of the appropriate sizes. Use them in your new design." And Ictinus did.

* Choisy. † Cloquet.

It has been suggested that the reason for repeating these old sizes of stones would seem more cogent if I expressed it in terms of money. Now this is rather difficult; but at least we may examine one detail. Even assuming that the 2 lowest drums of each of the 48 old columns of the peristyle and porches, the portions calcined by the burning scaffolding, were unfit for further use, there were probably, in the workyards on the Acropolis, about 336 unfinished drums in fit condition to be incorporated in the 46 peristyle and 6 rear porch columns of the present Parthenon, permitting a saving of about 100,000 drachmæ on the single item of the transportation of columns alone, at a time when the daily wage was one drachma, not twelve dollars. That is why 3 sets of columns in the present Parthenon are identical in diameters with those of the older structure; that is why old step blocks were re-employed in the present Parthenon even though the old clamp holes lay exposed to view in the new treads.

The peristyle was to be composed of a continuous line of columns of uniform diameter and uniform spacing, except, of course, at the corners. The column diameter was given by the old temple, $5\frac{5}{6}$ Attic feet; and the Periclean practice, the fruit of two centuries of experiment, was to give scale to their Doric colonnades by making the intervals exceed the column diameters by the width of a man across the shoulders, 1 cubit, so that smaller columns would be relatively widely spaced, and larger columns closely spaced, emphasizing the solidity which forms the striking characteristic of the Doric order. Adding, therefore, $5\frac{5}{6}$ and $1\frac{1}{2}$ feet, we have $7\frac{1}{3}$ feet for the interval. But now another consideration entered the problem, the desirability of a simple ratio between the column diameter and the interval. The nearest simple ratio between $5\frac{5}{6}$ and $7\frac{1}{3}$ was 4 : 5, and this was attained exactly by reducing the interval to $7\frac{7}{24}$ feet, a loss of about $\frac{1}{2}$ inch. Losses or gains of such amounts are found in most of the Periclean buildings, and represent the sacrifice which the architect was willing to admit in order to obtain a perfect ratio. By this method

Angle of the Parthenon—Contracted Column Spacing.



Plan of the Parthenon as Executed.

most designs were subject in the course of erection; but the resulting irregularities can all be explained. It was proposed that the four corners of the inner building should coincide with the intersections of the axes of the second columns on the façades and of the third columns on the flanks. And the faces of the inner columns were planned to lie, on the façades 16 feet, and on the flanks 14 feet, behind the faces of the columns of the peristyle, so that the inner top step, in turn, would lie 16 and 14 feet respectively inside the top step of the peristyle. The lower step of the inner building had been already set out in its proper position, perfectly symmetrical with relation to the outer peristyle, when the architect decided that the outer capitals were too small. Therefore the total width of the capitals, $6\frac{1}{8}$ feet on the south and west, was increased to $6\frac{1}{6}$ feet on the north, and finally to $6\frac{7}{24}$ feet on the east; but the architrave always remained $\frac{11}{32}$ foot behind the outer face of the capital, and so was displaced eastward and northward from the axes of the plan. To avoid differences in the ceiling panels, the inner building too was now pushed eastward and northward (in the latter case too far), so that the width of the step which surrounds it is $\frac{1}{8}$ foot greater on the west than on the east, and $\frac{1}{12}$ foot greater on the south than on the north. The inner columns of $5\frac{1}{4}$ feet inherited from the old building, and used in the rear porch, were eventually regarded as too heavy, and so those of the front porch were made more slender by $\frac{7}{32}$ foot (nearly 3 inches). The spacing of these inner columns differs on west and east, and even the projection of the antæ was erroneously increased by $\frac{1}{3}$ foot on the east, whereas originally all had been planned symmetrically.

Such were the main lines on which the plan was laid out. As for the elevation, well, as Kipling would say, that is another story.* Throughout the whole, however, it is apparent that the designers were working on the basis of centuries of precedent, following definite standards of pro-

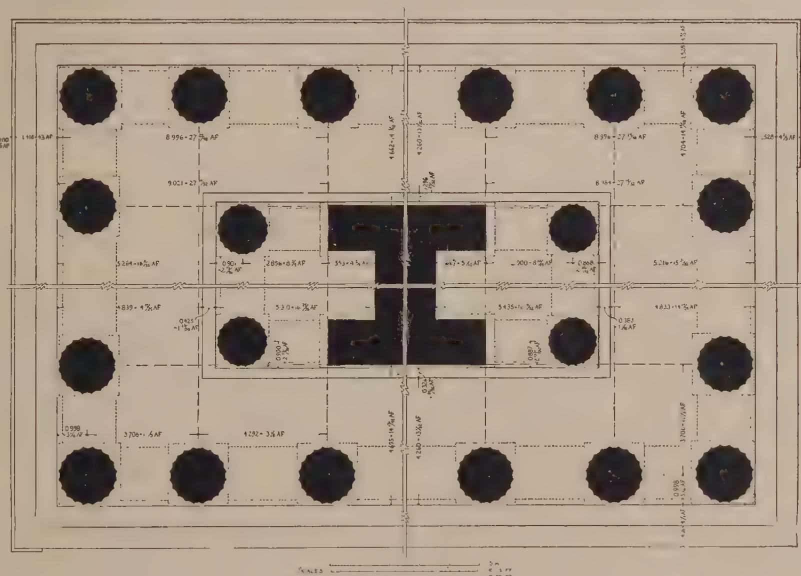
he obtained, in the Parthenon, an axial spacing of $13\frac{1}{8}$ Attic feet.

In the Older Parthenon the axial spacing had been, on the façades, $13\frac{1}{2}$ Attic feet. The new building would, therefore, if made six-columned like its predecessor, have been somewhat narrower; whereas, on account of the great gold-and-ivory statue proposed for the interior, a greater width was required. The only solution was to make the new temple eight-columned; and following the usual Periclean rule that the number of columns on the flanks must be one more than double the number on the façades, the peristyle received 8 by 17 columns, or 46 in all.

The endmost interval had to be contracted on account of the familiar difficulty of the angle triglyph in the frieze. Generally the Periclean architects adopted an empirical formula, making the contraction equal to a sixth of the column diameter. But in the Parthenon, partly because of a desire for exaggerated perspective effect, and partly because it was feared that an eight-columned façade thus built up by accretion might seem too wide in proportion to the unchangeable height of the columns, the angle contraction was nearly doubled, the clear interval being reduced to $5\frac{1}{2}$ feet, and the axial spacing to $11\frac{1}{3}$ feet, or $14\frac{1}{4}$ feet to the end of the colonnade. The subsequent enlargement of the angle column by $\frac{1}{40}$ of the diameter, for optical effects, reduced the clear interval to $5\frac{17}{48}$ feet, but the $14\frac{1}{4}$ foot dimension was retained.

The projection of the top step from the column centres was made equal to the projection of the capitals from the column centres, that is, on the west and south sides, which were carried out as planned, according to a perfectly definite law into which we have not time to enter; the north and east capitals were subsequently enlarged, as we shall see. With this projection, the plan of the top step measured $94\frac{5}{12}$ by $212\frac{13}{24}$ Attic feet, which cannot by any stretch of the imagination be interpreted as simple primary dimensions, nor as forming a simple ratio; they were the normal result of the growth of the plan from the given element, the column diameter.

While the outer shell was executed exactly as planned, the evolution of the architect's idea literally translated into marble, the case is quite different with the inner building. Here we have an example of the constant revision and alteration to which



Detail Plan, Corners of the Parthenon.

* It will be analyzed in my book, "The Culmination of Greek Architecture in the Age of Pericles"; here, too, I show that the designs of the other Doric temples of this period were laid out according to the system that was applied in the Parthenon.

portion and detail, standards which varied but slightly in each generation. No mysticism, no laws of ritual, no arbitrary applications of geometrical forms or of mathematical formulæ, but rather the juxtaposition of members carefully proportioned to each other and marvellously refined in detail, produced a whole, the general proportions of which could not have been foreseen at the beginning—which was, furthermore, often varied in the course of execution—resulting, however, in what may be regarded as the most perfect building that the world has ever seen. And yet it is instructive to note that the Parthenon, while synonymous with perfection, had its imperfections like every other human creation; and it is through these imperfections that we can perceive how its designers were groping toward their goal.

Tendencies in High Buildings

By Emil Lorch

Professor of Architecture, University of Michigan

PUBLIC interest in the high building has been greatly stimulated by the Chicago Tribune Building Competition. Like the modern battleship, the skyscraper, now a commonplace of our large cities, has had a rapid development. The early ones were ten to twelve stories in height, reaching their maximum when the solid masonry walls came to occupy too large a proportion of the lower floor areas. With the development of steel came the skeleton construction by means of which the walls were supported at each story by the steel frame, the masonry serving merely as an enclosure pierced by windows. On the ground floor, the masonry was reduced to a protective and decorative covering for the steel columns; such covering is required by building laws, since buckling under intense heat would involve the collapse of the entire structure. Parallel developments with the steel frame were fireproofing methods and materials, the elevator and other mechanical and electric devices, which were absorbed into the ever-increasingly upward-soaring structures.

The skyscraper admirably illustrates the unrestrained individualism which has so greatly hampered the proper development of our cities. Many of these buildings rob others of light and air and lower their rental value while increasing their taxes. Not until many city blocks had been solidly built up of high buildings reaching beyond the fly and dust line, the lower stories darkened and streets seriously congested, did building promoters become amenable to reason and agree to building regulations and zoning in order to protect their future building projects. Such regulations have been upheld by the courts, and should be studied and applied by all live communities.

Great ingenuity has been shown by architects in making plans for lots of varying size and shape so as to attract desirable tenants through good equipment, well-arranged corridors, offices, and exterior lighting. The exterior design from the very outset received careful study. Owing to the large sums represented by ground and construction cost, speed in the production of plans and in the construction of buildings became an important factor and has influenced design. The tremendous pressure of present-day business and production and the completeness of its building organization appear in the springing upward of riveted steel frames at the rate of a story a day, with masonry or terra-cotta enclosing walls often going forward simultaneously on several floor levels.

The Greek Doric temple and the Gothic cathedral, the two most consummate creations of architecture, and presenting an opportunity no greater than the skyscraper, both came at the end of a long evolution during periods when there was ample time for design and construction. There was a well-established architectural tradition in which emotion, form, and structural system fused, the style being a natural result. Our complex of races and associations, the marked economic bent of our development and the uncertainty as to what is most representative or expressive of us has brought about our hectic mixture of styles, the fundamental conditions for a single national embodiment not being existent.

The architecture of the colonies, the classical and Gothic revivals, the efforts of Richardson and his followers to adapt the Romanesque to American requirements and the Renaissance movement—all these have produced works of considerable merit, but the knowledge thus gained has not proven fully equal to the task of the high building.

Each historical style has rather definite associations, like the Romanesque and Gothic with certain human conditions, which brought mediæval ecclesiastical architecture into being. The "styles" represent a self-sufficient masonry construction, while steel construction logically reduced masonry to a mere enclosing or covering function. With the advent of the steel frame many designers continued to treat masonry hung on steel frames much as when it was self-supporting, while others, led by Louis H. Sullivan of Chicago, put forward the theory of function and form and insisted that the protected steel structural system be treated on its merits rather than imitatively. The first or traditionalistic group has continued to use or adapt historical form, while the second or progressive group has sought to derive the enclosing form from structure and to solve the dualism of rational hidden structure and expressive enclosing form in another material with its own practical and artistic implications. . . .

There is a growing body of architects who see the real goal and are slowly laying the foundation needed. Some of the better factory and commercial buildings are truer as modern design than many of the pseudomonumental structures whose forms belie their time and place and steel structure. And these men will presently receive the recognition due them. We accept the new poetry and the new music, as we have accepted impressionistic painting, and likewise new forms in architecture must take their proper place after undergoing the refining process of repeated study and use.

THE WARE MEMORIAL, MARTHA'S VINEYARD, MASS.

J. H. Freedlander, Architect.

Construction of the Apartment-House

By H. Vandervoort Walsh

Instructor of Construction, School of Architecture, Columbia University

ARTICLE VI

Rough Framing in Ordinary Construction

Defects in Floor Framing

EXCESSIVE deflection of floor-joists is not a matter to be passed over lightly. In the last article attention was called to the indifferent attitude which many builders of apartments had in respect to this matter. So long as the floor-joists were safe, they seemed to be satisfied that the interior stud partitions would stiffen the floor beams enough to prevent excessive deflection and cracking of the plaster.

This, however, does not always work, for the writer has observed cases where even the builder was puzzled. In the construction of one apartment the joists had been placed over a fairly large span, and were bound to develop considerable deflection. The interior stud partitions, which were to take up the sag, were, however, begun at the second floor and carried up, for the fireproof floor over the basement was not quite complete. The result was serious. The pressure of the sagging floor-joists on all the floors above was transferred down these studs to the second floor-joists, and this accumulation of loads was so great that these lower joists dipped down in the middle with a perilously deep curve—enough to worry the builder and give him much concern. It was nearly two inches, this deflection.

Another case, where results were bad, occurred after the bracing partitions were in place. Here the partitions were begun from the first floor up, but the studs were placed sidewise; that is, the two-inch side was the width of the partition and the four-inch side ran parallel with the partition. This was to save space, and is a very common thing to do. When the work was nearly complete and the plastering finished the partition on the first floor showed considerable bulge in it; enough to spoil the plaster and make the wall look extremely bad. It was the thin partition buckling under the load caused by the deflection of the beams.

Work of this kind is certainly shoddy, but then there is much poor construction in apartment-houses. A few other questionable ways of building parts of the floor might be mentioned in order to report clearly on the modern customs of building.

For example, here is a case that was noted. The usual 3-by-8 floor-joists were across a span of 20 feet. A fire-wall of brick ran parallel with the joists, and, in fact, the last joist framed almost against this wall. But a chimney came in the corner, and so did some pipes, with the result that this joist had no place upon which to have an end bearing. It was necessary therefore to put in a small length of joist from the wall out to the next joist, and then to support the end of the joist nearest the wall upon this short timber. Now, in a carefully built structure, this short timber would have been supported by a cleat nailed to the bottom of the joist or by a metal hanger, and the end of the joist, which it in turn supported, would have been fastened in the same way. But in this case the end of the joist and the smaller header piece were merely nailed. This was expecting a good deal of nails, especially since the joist had a span of nearly sixteen feet.

Mention might also be made of another case where the joists were held by nails. It is customary in preparing for the tile floors in bathrooms to frame the large joists around those parts where there will be pipes in the floor, as though this space were an opening. Regular header beams and trimmer beams are used, and metal hangers employed. The floor is then supported within this space upon small 2-by-4 joists, spanning across this opening. This gives room for pipes and also depth for the concrete foundation for the tile floor. Now, one would naturally expect a good bearing for these small joists where they are supported upon the trimmer beams, such as a cleat fastened to the bottom of the trimmer beams. But it is common practice to merely nail the ends of these timbers which hold up the weight of the tile floor.

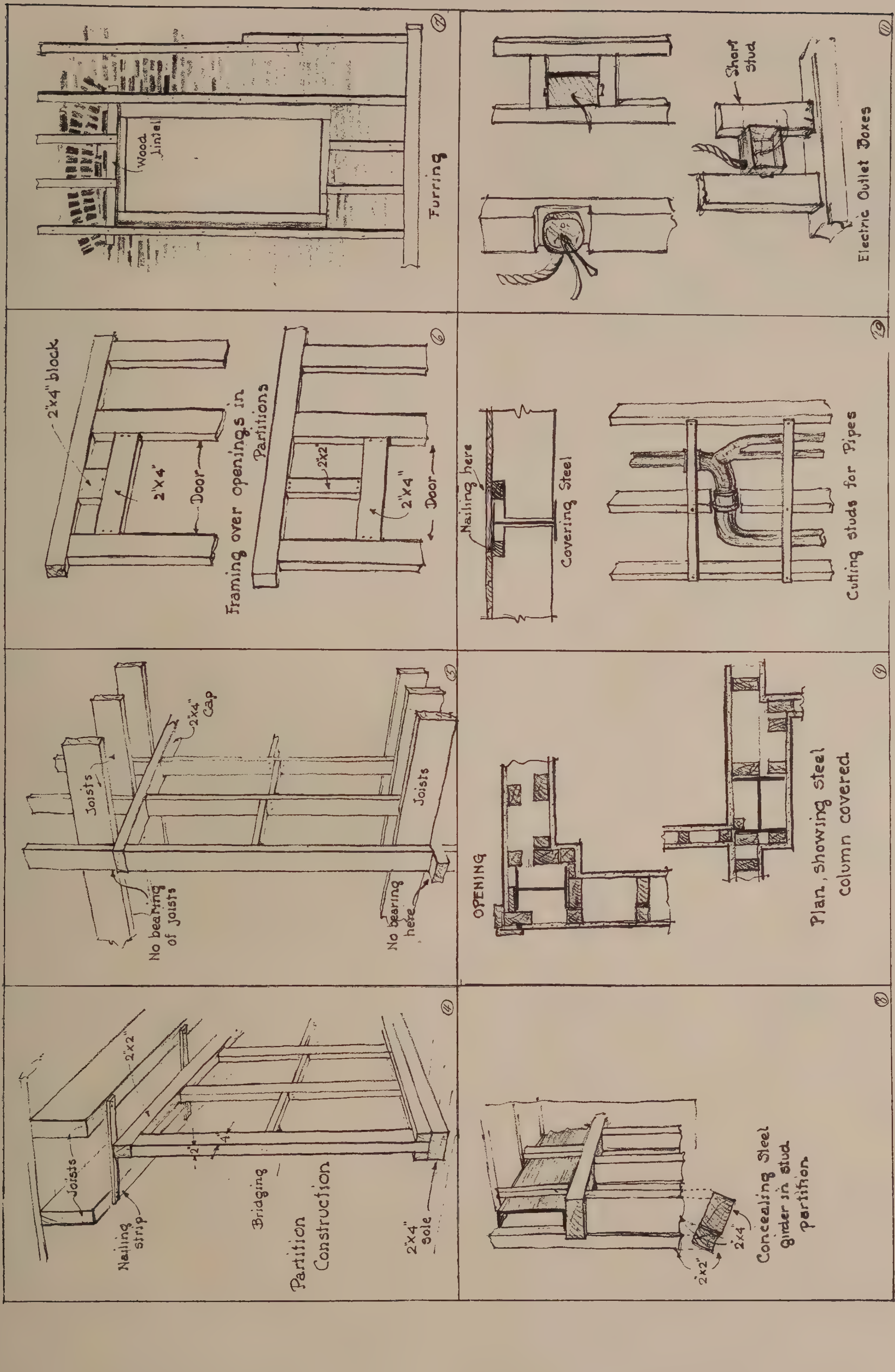
Other careless details of construction have been noticed. The bearing ends of joists which were supported upon the steel girders have been notched out so much at the bottom that only about one-half the full strength of the timber has been left; and the bearing ends of the timbers in the wall have been brought up to the correct level with little chips of wood.

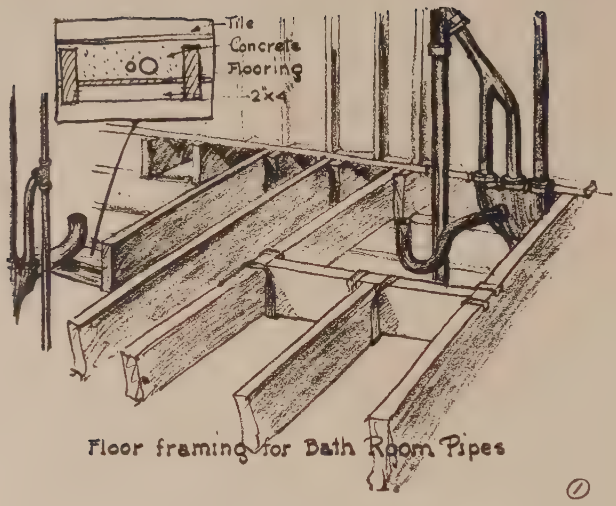
Partitions

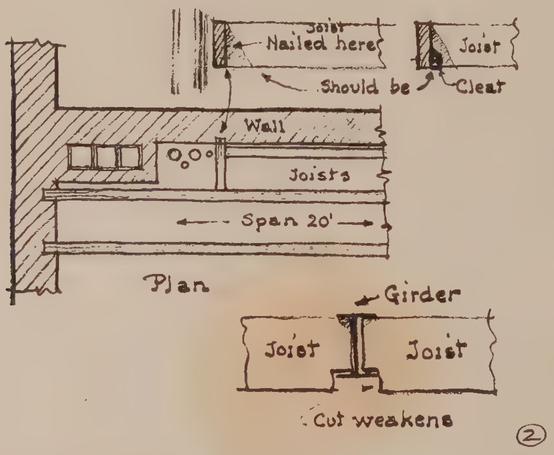
The partitions, other than those used as fire-walls or interior bearing walls, are in ordinary construction built of 2-by-4 studs. None of them carry any weight, except that those which run at right angles to the joists, near the middle of the span, take the weight of the deflection of the beams, as previously described.

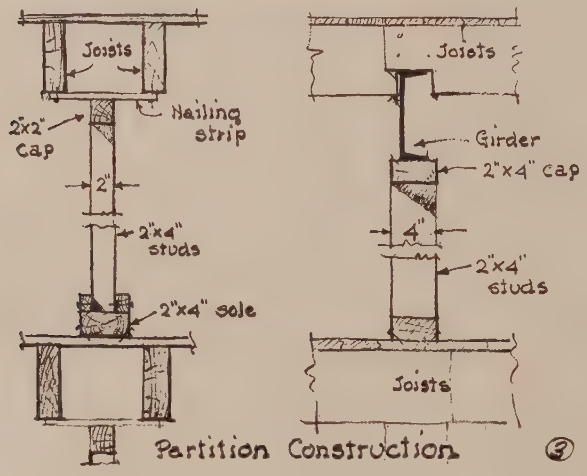
When the first floor and other floors have been covered over with the rough underflooring, the partition studs are erected upon the top of sole pieces which are nailed down on the rough flooring. These sole pieces are 2-by-4's, resting with their 4-inch side down on the floor, no matter whether the partition studs are to be erected with their 4-inch sides parallel with the direction of the partition or their 2-inch sides.

The studs are always 2-by-4's set 16 inches on centres, and are usually constructed so that the studs are set flatwise, making the partitions thinner than if set edgewise. Certain partitions, however, need to be thicker in order to have in them pipes, and here the studs are placed edgewise. Moreover, all those partitions which run at right angles to the joists are usually built with the studs edgewise in order to add to the strength of them, since where they are built one above the other the studs of the partition above run down between the floor-joists to the cap of the partition below.


Joists
2"x2"
Nailing strip
Bridging
2"
4"
Partition Construction
2"x4" sole
4
Joists
2"x4" Cap
Joists
No bearing of joists
No bearing here
5
2"x4" block
2"x4"
Door
2"x2"
2"x4"
Door
Framing over openings in Partitions
6
Wood lintel
Furring
7
Concealing Steel girder in stud partition.
2"x2"
2"x4"
8
OPENING
Plan, showing steel column covered.
9
Nailing here
Covering Steel
Cutting studs for Pipes
10
Short stud
Electric Outlet Boxes
11







Those partitions which run parallel with the floor-joists usually are capped with a 2-by-2 piece, which is nailed to small strips of wood fastened across the bottoms of two joists, as shown in the sketch. The sole piece that is used for the base of the studs, when they are placed sidewise, projects out beyond them. A small strip is then nailed along the top of this, each side of the studs, and these strips with the sole piece serve as nailing strips for the baseboard.

Those partitions which have the studs edgewise have the sole pieces as wide as the studs, and in this case the nailing strip must extend down to the rough floor. The partition, too, instead of being a 2-by-2 is a 2-by-4. If such a partition runs under the steel girder, the cap is wedged up to the soffit of the girder. In this case the girder is usually a channel, instead of an I-beam, for the width of it will not then extend beyond the width of the partition.

Most openings, since they have transoms above them, are framed nearly to the top of the partition. A 2-by-4 block is sufficient to place in the middle, and then the cross-piece is nailed up close to this block, and the ends, too, nailed into the studs at the sides of the opening. Wherever there are openings which need to be framed lower, the block at the centre is replaced with a 2-by-2.

At least once in their height these partitions are braced with cross bridging, not of the herring-bone type, but the ordinary horizontal kind, as shown in the drawing.

The inside of all exterior brick walls is furred with 1-by-2 strips, spaced 16 inches on centres, and nailed into the brick joists about every twelfth course. These are often spliced, as shown. Around the windows they are spaced up to the frame and edge the brick opening.

Miscellaneous Framing Details

There are a number of different problems of special importance that are met with in framing partitions. For example, there is the necessity of framing around steel H columns or around steel girders, so that they will not appear to break up the wall surfaces. A few examples of the way this has been done are shown, but of course these are bound to be special cases and not general. Nevertheless, they suggest solutions for other conditions.

Then, too, there always comes up the difficulty of securing nailing for the rough flooring near masonry walls or over the tops of steel I-beams. The drawings show how this has been done.

Pipes in partitions also present difficulties, and each case needs attention. One example of this problem is shown.

Electric outlet-boxes need support, too. Examples of common practice are shown, but they are not recommended as the finest work, but only represent the average rough workmanship.

(*To be continued*)

Very Little Virgin Timber Left.—Nearly half the land area of the United States, some 822,000,000 acres, was originally forested, says an article, but the forested area has now been reduced to 138,000,000 acres of virgin forest, 250,000,000 acres of comparatively inferior culled and second growth, and 81,000,000 acres of barren land, a total of slightly less than 470,000,000 acres.

"Largely through timber mining," it continues, "the original stand of timber has been reduced from more than 5,200 billion board feet of virgin timber to 1,600 billion feet of virgin timber and 600 billion feet additional in culled and second-growth stands.

"Seventy-five per cent of the remaining virgin timber is west of the Great Plains."

Drafting-Room Mathematics

By DeWitt Clinton Pond, M.A.

NINTH ARTICLE

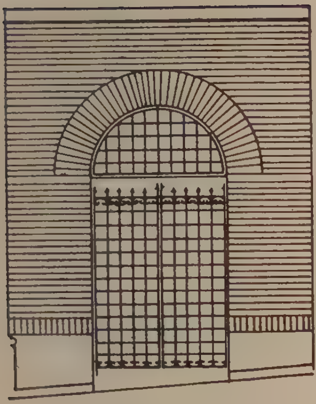


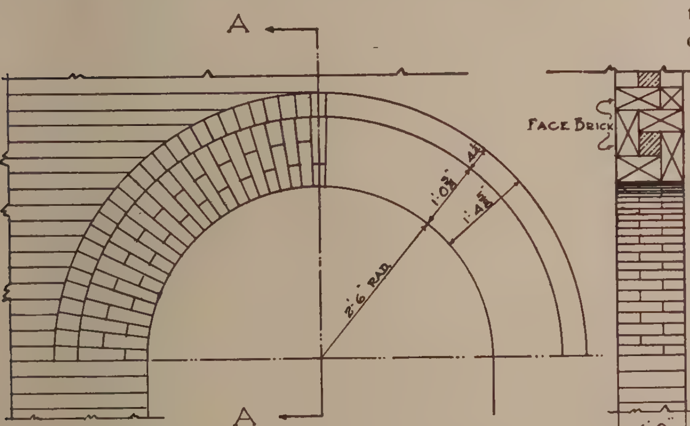
FIGURE 39

WHEN the quarter-scale drawings are all completed for any building the next step is the drawing of details. Among others it is quite possible for the draftsman to have to make full-size drawings of such brick arches as are to be used in the design of the building. In this case he will be called upon to make certain calculations in order to determine the number of bricks to be used in the arch, and this will be necessary no matter if the bricks are moulded or ground. If moulded brick are to be used these can be made any size, and it depends upon the artistic appearance of the arch as to just what the size shall be. In case it is necessary to grind the brick, then the size is limited by the actual dimensions of such brick as are to be used. In a case of this sort the designer is sometimes called upon to vary his design to fit the conditions. To-day, owing to the fact that it is difficult to obtain deliveries of moulded brick within the time that is required by most architects and contractors, it is a common practice to use ground brick, and this is the case in the problem which will be discussed in this article.

In Fig. 39 is shown the one-quarter-inch elevation of the arch which is to be detailed. In making the original drawing it was believed that moulded brick would be used. However, owing to the considerations given above, it was finally decided to use ground brick, and the arch was detailed as shown in Figs. 40 and 41. Fig. 40 shows the three-quarter-inch elevation and section, and Fig. 41 shows the method of drawing a full-size portion of the arch. In the full-size drawing the actual dimensions of the brick are shown, and in order for the draftsman to determine what the largest size can be it is necessary to obtain a few samples of the brick which show the variation in the sizes. After measuring these samples it will be necessary to decide upon average dimensions, and from this the distance from centre to centre of joint can be determined. From the samples of brick which were to be used in the arch, which will furnish the basis of this discussion, the average length of each brick was determined as $8\frac{1}{16}$ inches. The average distance across each header was $3\frac{13}{16}$ inches, and the average thickness was found to be $2\frac{1}{4}$ inches. From this last dimension it was determined that the ordinary brick joints would be $2\frac{3}{4}$ inches on centres, as the mortar joints were $\frac{1}{2}$-inch thick.

The diameter of the arch was given in the plan as 5 feet, so that the radius is 2 feet 6 inches. The distance from the inside to the outside circumference of the arch—the length of a voussoir—measured on the one-quarter-scale elevation, was found to be 1 foot 4 inches. The nearest dimension to this which can be obtained by using the average sizes given above is 1 foot $4\frac{5}{8}$ inches. This dimension is obtained by adding two lengths each of $8\frac{1}{16}$ inches and a joint of $\frac{1}{2}$ inch. By adding 1 foot $4\frac{5}{8}$ inches to 2 feet 6 inches the radius of the outer circle, along which the brick would be laid off with radiating joints, $2\frac{3}{4}$ inches on centres, can be obtained. It was found that if the joints radiated from the centre to this outer circle, the joints at the soffit of the arch became too close on centres. This difficulty could have been overcome had the bricks been moulded, as the joints at the outer circle could have been made any distance on centres desirable, but with this limited by the size of the brick it was decided that there could not be such radiating joints as indicated on the one-quarter-inch elevation. It was decided that there should be an outer ring of headers, as shown in the figures, and that the joints should radiate from a circle having a radius 3 feet $6\frac{3}{8}$ inches long.

The next step is the determination of the number of joints that can be measured along each of the two circles. It is therefore necessary to determine the length of a quarter of the circumference for the two circles having a radius of 3 feet $6\frac{3}{8}$ inches and 3 feet $10\frac{5}{8}$ inches.



3/4" SCALE ELEVATION
FIGURE 40

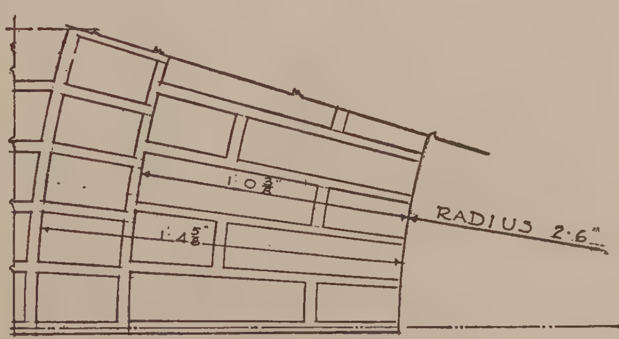


FIGURE 41

To find the circumferences of such circles it is simply necessary to look in the tables of circumferences as given in almost any handbook. It will be necessary, however, first to reduce the dimensions given above to their decimal equivalents: 3 feet $6\frac{3}{4}$ inches becomes 3.5313 feet and 3 feet $10\frac{5}{8}$ inches becomes 3.8854 feet. It would be possible to multiply each of these figures by 2, and then to find the corresponding circumferences for circles having such diameters, but as it will be necessary to divide such a length by 4 in order to determine the number of brick courses in one-quarter of the circle, the more simple manner would be to find the circumferences corresponding to the numbers already established and to divide by 2. It can be found by referring to any table of circumferences that the one corresponding to 3.5313 is 11.095, and to 3.8854 is 12.206. The quarter-circumference corresponding to each radius is 5.547 in one case and 6.103 in the other. In order to obtain these results it was necessary to interpolate in the tables, but the processes of interpolation have been explained in previous articles and need not be discussed here.

Of course, the use of tables only reduces the work of determining the circumference. If the draftsman does not have the tables at hand he can obtain the same result by multiplying the radii by 3.1416, and by dividing these results by 2. If he has followed the discussions in previous articles so far, he may be interested in checking the results by the use of logarithms. In this case it will be necessary to look up the logarithms of 3 feet $6\frac{3}{8}$ inches, 3 feet $10\frac{5}{8}$ inches, 3.1416, and 2. These are listed below:

$$\begin{aligned} \log 3 \text{ feet } 6\tfrac{3}{8} \text{ inches} &= 0.54793 \\ \log 3 \text{ feet } 10\tfrac{5}{8} \text{ inches} &= 0.58944 \\ \log 3.1416 &= 0.49715 \\ \log 2 &= 0.30103 \end{aligned}$$

The next steps will need no explanation as they are in accordance with the methods used in previous articles.

$$\begin{aligned} \log 3 \text{ feet } 6\tfrac{3}{8} \text{ inches} &= 0.54793 \\ + \log 3.1416 &= 0.49715 \\ \hline & 1.04508 \\ - \log 2 &= 0.30103 \\ \hline & 0.74405 \end{aligned}$$

$$0.74405 = \log 5 \text{ feet } 6\tfrac{9}{16} \text{ inches}$$

$$\begin{aligned} \log 3 \text{ feet } 10\tfrac{5}{8} \text{ inches} &= 0.58944 \\ + \log 3.1416 &= 0.49715 \\ \hline & 1.08659 \\ - \log 2 &= 0.30103 \\ \hline & 0.78556 \end{aligned}$$

$$0.78556 = \log 6 \text{ feet } 1\tfrac{1}{4} \text{ inches}$$

It will be seen that these results check with the ones obtained above. To one who is practised in the use of logarithms the second method is as short as the first, and furnishes an easy method of checking.

In order to find the number of brick joints it will be necessary to first subtract one-half the distance between joints, as the centre line cuts the brick at the top of the arch in two. The joints will be approximately $2\frac{3}{4}$ inches apart. There may be a slight variation from this in the final result, but such variation will be small. The quarter-circumferences have been found to be 5 feet $6\frac{9}{16}$ inches and 6 feet $1\frac{1}{4}$ inches, and if $1\frac{3}{8}$ inches are subtracted from these dimensions the results will be 5 feet $5\frac{3}{16}$ inches and 5 feet $11\frac{7}{8}$ inches.

In all architectural offices there are tables giving the dimension from centre to centre of joints of any given number of brick courses. By referring to such a table it will be found that for $2\frac{3}{4}$-inch courses the nearest dimensions will be 5 feet 6 inches, which will be the distance from centre to centre of joints for 24 courses, and 5 feet $11\frac{1}{2}$ inches, which will be the corresponding distance for 26 courses. By referring to Fig. 40 it can be seen that these are the numbers of joints in the inner and outer circles of bricks.

As a check on the figures given above it is good practice to determine the exact distance between centres of joints in the arch. It is necessary to know this distance also in order to develop the full-size detail as shown—reduced—in Fig. 41. Of course, it is perfectly possible to do this by means of ordinary arithmetic by reducing the lengths of the quarter-circumferences to inches, and by dividing by $24\frac{1}{2}$ and $26\frac{1}{2}$, but, as the logarithms of these dimensions have already been determined, it is a very easy process to determine the spacing by the method given below. The only new logarithms which must be looked up are those of 24.5 and 26.5.

$$\begin{aligned} \log 24.5 &= 1.38917 \\ \log 26.5 &= 1.42325 \end{aligned}$$

By using the logarithms of 5 feet $6\frac{9}{16}$ inches and 6 feet $1\frac{1}{4}$ inches, as found in the previous calculations, and by subtracting those just determined from them, the following results are obtained:

$$\begin{aligned} \log 5 \text{ feet } 6\tfrac{9}{16} \text{ inches} &= 0.74405 \\ - \log 24.5 &= 1.38917 \\ \hline & 9.35488 \end{aligned}$$

$$9.35488 = \log 2\tfrac{25}{32} \text{ inches}$$

$$\begin{aligned} \log 6 \text{ feet } 1\tfrac{1}{4} \text{ inches} &= 0.78556 \\ - \log 26.5 &= 1.42325 \\ \hline & 9.36231 \end{aligned}$$

$$9.36231 = \log 2\tfrac{3}{4} \text{ inches}$$

From the results obtained above it can be seen that the joints on the inner circle will have to be compressed one-thirty-second of an inch. In other words, the mortar joint between the bricks will measure $\frac{15}{25}$ of an inch instead of $\frac{1}{2}$ inch. In the outer circle the joints would be a very small fraction of an inch more than one-half inch, but the fraction would be so small that it would be impossible to measure it at the building.

To recapitulate the steps taken in order to determine the number of brick courses in the two circles, it was first necessary to measure the brick which were to be used in the arch to determine the distance from centre to centre of joint in the ordinary course, and to find the lengths of the radii which would furnish the basis for later calculations. Then, once the radii were determined, it was necessary to find the lengths of the quarter-circumferences. From these lengths it was necessary to subtract one-half the distance between brick joints—$1\frac{3}{8}$ inches—and then to find the number of courses it would take to make the remaining distances. Once the number had been found it was possible to determine the exact distance between joints.

In some offices it is the practice to draw a full-size drawing of one-quarter of such an arch as has been discussed in

this article, in which case the distance between joints can be found by means of dividers. If this is done it is not necessary to carry through the last calculations. In order to do this, however, it is necessary to make a very large drawing, which would take time and be cumbersome to handle. Another method is to carry out the calculations as has been done above, and to draw only a part of the arch at the full-size scale, using the dimensions already found as the distance between joints, as shown in Fig. 41, and then to show a three-quarter elevation and section to give the number of bricks and methods of laying. This makes a very compact drawing.

It is necessary to draw a section, as shown in Fig. 40, to show how the brick is laid. In the case under discussion the arch was in a 12-inch brick wall, with face brick on each side. For this reason it was shown in the section that where a header occurred in the front of the wall there would be a stretcher in the back, and, in other words, the two arches were opposites.

The case under discussion was a comparatively simple one. If the brick had been moulded instead of ground it might have been even more simple, as the joints could have radiated from the inner to the outer circumference without breaking. In this condition the distance between courses at the outer circle would have been greater than $2\frac{3}{4}$ inches, but as the brick could be moulded to any size, the distance between joints could be made as required to suit the fancy of the designer.

There are arches which are by no means as simple to detail as the one used in this article. In some cases the arches are pointed rather than circular, in which case the detailer will have a somewhat difficult problem in determining how to lay out his courses. If the discussions given in the last article are remembered and applied in combination with those in this article, there should be no difficulty in determining distances between the spring and centre of the arch along any segment of the arch.

Brick

By William Carver

Architect of the Common Brick Manufacturers' Association

A BRICK is a solid building unit of burned clay, according to twenty-two dictionary definitions. Clay suitable for brick-making is found pretty evenly distributed in almost every State of the Union and in every part of the world. While the details of handling the material vary greatly in various places and from one age to another, the basic principles of its manufacture remain the same; namely, the clay is first formed into the proper shapes, dried, and then burned in a fire of sufficient intensity and duration to transform the brick into a hard, dense mass capable of resisting the elements for generations, wonderfully strong, and as near fireproof as any building material is ever likely to be.

And again, referring to the strength of the individual brick, some of you who have visited brick-yards know that even before the brick are burned they will stand tremendous stresses without suffering any damage. The "green" brick are piled up sometimes to a height of twenty feet in the kilns with no chance of lateral support inasmuch as they have to be spaced a slight distance apart to permit the fire to pass between them. After being burned, the strength of the brick is, of course, increased, and the A. S. T. M. specifications define what a brick should be expected to stand. In practice, however, these minimum requirements are very often exceeded. We have records in our office of a test made at Watertown Arsenal in 1904 of a brick produced in the northern part of New York State which sustained the enormous load of 26,763 pounds per square inch at failure, or 1,926 tons per square foot. That is, of course, exceptional.

I would also like to draw your attention to the possibilities of the ideal wall, which our association has been promoting for the past three years, as a possibility of developing business for those of your members who build homes. I think the wall has been advertised enough so that every contractor is familiar with the principle of its construction, which is simply that of laying the bricks on edge instead of on their flat bed, thus making a hollow wall of solid brick. This rather simple change produces far-reaching results. In an eight-inch wall, for instance, it reduces the number of brick from 12¾ per square foot to 9 brick per square foot; and mortar required, from .193 cubic foot per square foot to .08 per square foot. With the saving in labor and in the elimination of furring, the cost of the brickwork is reduced fully one-third. This is the claim we made shortly after we started to promote the use of this wall, and this claim has been made good over and over again.

Finds Small Houses Can Use Eight-Inch Brick Walls

THAT eight-inch brick walls can be used in one and two family houses having walls under thirty feet high was one of the conclusions reached in a recent extensive investigation of building codes by the Building Code Committee of the Department of Commerce. This conclusion was reached as a result of careful analysis of building codes, of a series of fire tests conducted at the Bureau of Standards, and of a series of strength tests conducted at the same institution. It is expected that this recommendation will result in a subsantial saving in construction cost, as the present building codes usually require thicker walls than this. Exception must, of course, be made in regions liable to earthquake shock.

Beginning in July, 1921, the Building Code Committee of the Department of Commerce has been studying and comparing building codes from all over the country as applied to small houses. The Bureau of Standards has been cooperating closely with it and has furnished much of the experimental work on which the findings of the committee are based. Its work is now completed and is embodied in a publication entitled "Recommended Minimum Requirements for Small Dwelling Construction." This publication has now gone to press. It can then be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 15 cents a copy.

The book begins with a discussion of the origin of the committee and its methods of working. Then some of the more important of its findings are discussed. This is followed by a standard building code which covers the minimum requirements. It is written in such form that it may be adopted without change in wording either as a building code or as an amendment to existing codes. It is intended to serve as a guide and a standard in the formation of local building codes. The latter part of the book is taken up with an extensive detailed discussion of the recommendations made and the data on which they are based. It is freely illustrated and contains much information of value to architects and builders.

The Quality of Materials

By Richard P. Wallis

FIRST ARTICLE

THE architect's supervisor will be called upon from time to time in the exercise of his duties to judge of the quality of the various materials delivered to the job for incorporation therein. It is very necessary that these materials be subjected to a rigid inspection as they come to the job, as the strength and appearance of the finished structure depend in no small manner on the character of the various ingredients of which it is composed.

There are three methods of determining the quality of materials and workmanship: *First*, by reports from laboratory tests; *second*, simple field tests; and, *third*, inspection of material to ascertain whether or not there are present those physical characteristics that will insure strength, durability, and finish in the completed structure.

Under the terms of the contract the architect or engineer is made the sole judge as to what material may be incorporated in the work. In order to intelligently perform this function it is essential that he or his representative be familiar with the various methods used in determining the suitability of building material, in order that the owner's interests may be protected and at the same time not subject the contractor to unreasonable and unnecessary requirements owing to the architect's inexperience or inability to recognize the dictates of good building practice.

The laboratory tests are made in laboratories especially equipped for the purpose of accurately determining the chemical and physical properties of the various materials. These tests are of such a nature as to preclude of their being made in the field. The results are summarized and submitted to the architect in a report that enables him at once to determine whether or not the material is suitable for the purpose for which he wishes to use it.

Some recognized standard is usually referred to in the specifications as the criterion to which the particular material is to be compared. The standards usually adopted in this connection are those of the American Society for Testing Materials.

The following list is of those particular standards that refer to the materials most commonly encountered in the erection of a building or other structure:

STANDARDS OF THE AMERICAN SOCIETY FOR TESTING MATERIALS

Note: (s.s.) = standard specifications
(s.t.) = standard tests
(s.m.) = standard methods
(s.d.) = standard definitions

E.	*Cement.*	Portland Cement. (s.s.)	C	9–21
		Portland Cement, Mortar and compressive strength. (s.s.)	C	9–16T
		Natural Cement. (s.s.)	C	10–09
F.	*Reinforcing Steel.*	Billet Steel. (s.s.)	A	15–14
		Rail Steel. (s.s.)	A	16–14
G.	*Concrete.*	Unit weight of Aggregate for Cement Concrete. (s.t.)	C	29–20T
		Concrete Specimens. (s.m.)	C	31–20T
I.	*Lime.*	Quicklime. (s.s.)	C	5–15
		Hydrated Lime. (s.s.)	C	6–15
		Masons' Hydrated Lime. (s.s.)	C	6–19T
		Chemical analysis Limestone, Lime, etc. (s.m.)	C	25–19T
J.	*Brick.*	Building Brick. (s.s.)	C	21–20
P.	*Structural Steel.*	Structural Steel for Buildings. (s.s.)	A	9–16
Q.	*Cast Iron.*	Cast-Iron Pipe and Special Castings. (s.s.)	A	44–04
		Cast-Iron Soil Pipe and Fittings. (s.s.)	A	45–14
R.	*Wrought Iron.*	Welded Wought-Iron Pipe. (s.s.)	A	72–18
T.	*Lumber.*	Terms relating to Structural Timber. (s.d.)	D	9–15
		Structural Douglas Fir. (s.s.)	D	23–20T
U.	*Paint.*	Purity of Raw Linseed-Oil from North American Seed. (s.s.)	D	1–15
		Purity of Boiled Linseed-Oil from North American Seed. (s.s.)	D	11–15
		Turpentine. (s.s.)	D	13–15
		Paint Thinners other than Turpentine. (s.t.)	D	28–17
		Shellac. (s.t.)	D	29–17
		Flash Point Volatile Paint Thinners. (s.t.)	D	56–19
		Routine Analysis White Pigments. (s.m.)	D	34–17
		Routine Analysis Dry Red Lead. (s.m.)	D	49–18
		Routine Analysis Yellow, Orange, Red, and Brown Pigments containing Iron and Manganese. (s.m.)	D	50–18
		Terms Relating to Paint Specifications. (s.d.)	D	16–15
BB.	*Built-Up Roofing.*	Asphalt for use in Dampproofing and Waterproofing. (s.s.)	D	40–17T
		Primer for use with Asphalt for use in Dampproofing and Waterproofing. (s.s.)	D	41–17T
		Coal-Tar Pitch for use in Dampproofing and Waterproofing. (s.s.)	D	42–17T
		Creosote Oil for Priming Coat with Coal-Tar Pitch for use in Dampproofing and Waterproofing. (s.s.)	D	43–17T
		Determination of Softening Point of Tar Products. (Cube in Water Method.) (s.m.)	D	61–20
FF.	*Plaster.*	Gypsum. (s.s.)	C	22–20T
		Calcined Gypsum. (s.s.)	C	23–20T
		Gypsum Plaster. (s.s.)	C	28–20T

The field tests are usually simple in their nature and require but little equipment. The supervisor should provide himself at the start of the job with a 6-foot rule, a 1-pound mechanic's hammer, a pair of calipers, a small magnifying-glass, and a flash-light. This equipment will serve to determine size, grade, and condition of material. In addition will be required various bottles, acids, etc. These may always be procured as needed from any drug-store.

The value of inspection in determining the quality depends largely upon the experience and judgment of the supervisor. Such inspection consists for the most part in examining the appearance of materials and workmanship in the light of past experience.

When it is demonstrated that materials fail to meet the requirements imposed they should be promptly ordered removed from the job in order to avoid subjecting the contractor to the temptation of using such material during the absence of the supervisor.

The following text is a compilation of various methods of determining the acceptability of materials destined for inclusion in buildings or other structures that have come to the attention of the writer from time to time.

A. Subsoil Tests

It is always advisable and sometimes necessary in the erection of a building or other structure to investigate the subsoil conditions of the site in order to determine the strati-

fication of the soil, subsurface water conditions, and the bearing value of the soil. The scope of these investigations will be determined by the size and character of the structure to be erected.

I. *Inspection.*—The topographical features and location of the site will often be useful in determining what subsoil conditions exist. The experience of others who have dug excavations in the same neighborhood will be useful in this connection. An investigation of open trenches or pits already existing near the site will frequently suffice to give the necessary information in case the character of the building is of not too great importance to warrant more extensive investigation.

II. *Steel Rods.*—The use of the sounding-rod in making preliminary investigations of subsoil conditions has much to recommend it. The ease and slight cost with which this operation may be carried on enables a much more thorough investigation of the site in question to be carried on than with the other more expensive methods. When carefully made and correctly interpreted the soundings afford a very fair idea as to the prevailing subsoil conditions underlying the site.

The equipment consists of several sections of $\frac{5}{8}$-inch round steel rod. One section is pointed at one end and threaded at the other. The other sections are threaded at both ends in order that they may in turn be joined to the pointed section and thus increase the length of the rod as needed. A metal cap with a lignum-vitæ block inside to act as a cushion forms the driving head. An 8-pound sledge-hammer, two Stillson wrenches, and a short section of chain and lever for purpose of withdrawing the rod complete the outfit.

The pointed section is driven until nearly level with the ground, and a midsection then coupled to it and the driving continued. This is repeated until refusal under average blows is obtained. The rod is then withdrawn, the penetration measured, and the operation repeated within a distance of 4 feet. In this manner by a series of soundings it is possible to determine whether or not the obstacle encountered is an isolated boulder or bed-rock. This operation is continued over as much of the area under investigation as is thought necessary in order to obtain conclusive evidence as to the depth of bed-rock.

The entire cost of this operation is small, as two men can easily make a sounding to a depth of 25 feet and withdraw the rod in the course of an hour.

Future and more exhaustive investigations may be thought prudent based on the information secured by means of these soundings. This method, while useful for preliminary investigations, is the least exact of any. It affords no samples and requires considerable previous experience to identify the material penetrated.

III. *Auger Borings.*—The equipment necessary for this test consists of a 1-inch carpenter's auger welded to the end of a section of 1-inch galvanized-iron pipe. Additional lengths of pipe may be added by means of pipe unions to increase the depth to which the auger may be sunk. A pick head secured by wedges serves as a handle. This handle is raised as the auger works its way into the ground.

A section of pipe of slightly larger diameter than the auger pipe is first driven into the ground to serve as a casing. The auger is then inserted and made to penetrate the ground by one or two men at the handle imparting a rotary motion to it.

Samples of soil may be obtained by withdrawing the auger from time to time and removing the soil engaged in the auger. In this manner the stratification of the ground may be determined at any desired point or points.

A surprisingly large number of borings may be made in this manner in a short time and at a small cost.

IV. *Wash-Drill.*—One of the best ways to test a foundation is with a wash-drill outfit, consisting of a drill point to which is coupled 1-inch pipe in 4-foot lengths. Water is forced through this pipe by a double-acting force-pump operated by one or two men. Tests have been made with such an outfit to depths as great as 60 feet.

The wash-drill may be used with or without a jacket-pipe. If a jacket-pipe is used, it should consist of a light-weight pipe about 3 inches on the inside diameter, cut into 4-foot lengths, which may be coupled on as the pipe sinks into the ground. The benefit of the jacket-pipe is that it preserves the borings for future use and that the material inside the pipe is washed up to the surface, where it may be examined.

Such a pumping outfit is that owned by the Office of Public Roads, which consists of a double-acting force-pump, with a cylinder 5 inches in diameter, a 5-inch stroke, a 2-inch suction, and an inch and a half discharge. The pump is fitted with two 12-foot lengths of suction-hose with a strainer, two 12-foot lengths of pressure-hose, twelve 4-foot lengths of 1-inch extra heavy iron pipe and a drill point.

V. *Open Pits.*—Open pits of size sufficient to permit of the use of pick and shovel afford direct inspection of the undisturbed materials of which the soil is composed. Sheet piling may be necessary in certain soils to prevent caving of the sides. These pits afford an excellent means of studying the fluctuation of the ground water should it be encountered.

If these pits are carried down only to the level of the footings, further investigations should be made either with sounding-rod or auger.

Excavations for walls, footings, basements, sewers, etc., will often serve as pits for purposes of observation.

VI. *Test Loads.*—Loading tests of the materials composing the subsoil are made by applying a known weight to a known area, and measuring the resulting settlement in order to determine its safe bearing capacity.

There are many types of apparatus used for carrying such tests. One method is as shown in Fig. I and described as follows:

A square platform approximately 8 feet square rigidly put together by bolts is supported on the end of a vertical stick 14 inches by 14 inches of sufficient length to permit of easy loading of the platform. This vertical member in turn rests on a cast-iron plate, 24 inches by 24 inches, thus affording a bearing area of 4 square feet. This iron plate should rest on a thin layer of 1 : 3 grout laid directly on the undisturbed soil, and should be carefully levelled before the grout has set. After the plate is in place and the grout set, the rest of the platform may be assembled and the hole partially back-filled around the plate. Screw-jacks are set at each corner of the platform during this operation to keep the weight of the platform from disturbing the equilibrium of the bearing-plate.

The test load may consist of any material having the requisite weight and size to permit of easy handling. Iron rails, pig iron, sacks of cement, etc., may all be used, depending somewhat upon their availability. The platform should be carried on the four jacks at all times during the process of loading or unloading in order to prevent any incidental motion being conveyed to the plate.

The load on the platform is increased in whatever increments thought best at intervals of a day or so apart. Readings are taken on the platform with an engineer's level both before and after loadings and twice a day between

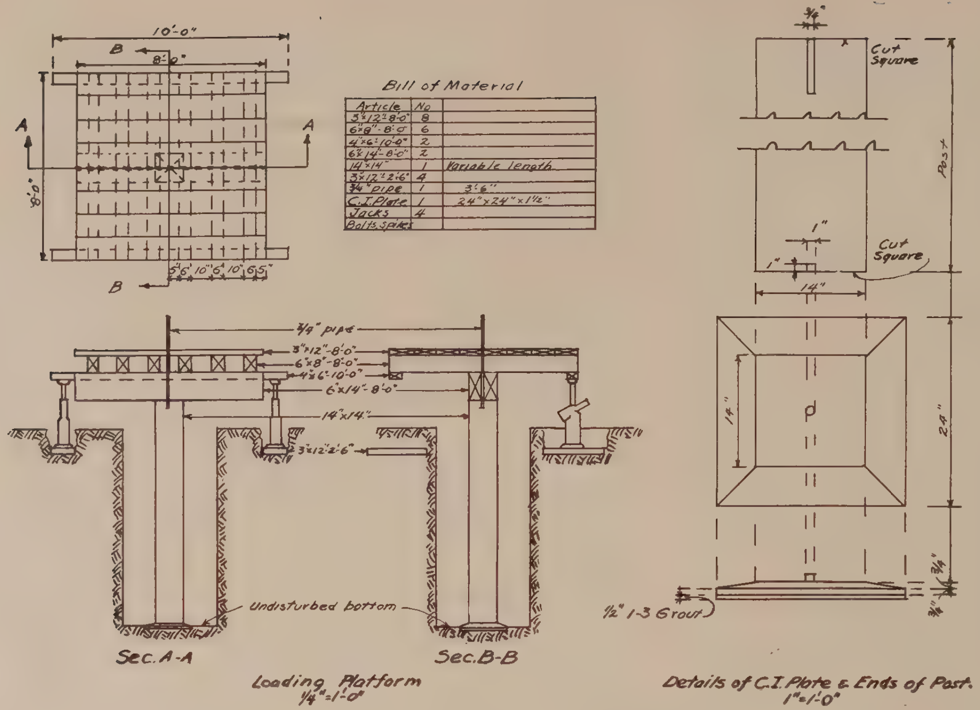


FIG I. LOADING PLATFORM

loadings. It is advisable to have two or more permanent bench-marks in order to check each reading. In this manner the amount of compression of the soil is obtained, and knowing the total loading the unit resisting power of the soil may easily be calculated.

"The Special Committee to Codify Present Practice of the Bearing Value of Soil for Foundation" of the American Society of Civil Engineers in its progress report, Vol. XLVI, No. 6, of the Proceedings, presented to the society, January 1, 1920, describes a simple and efficient method of observing and recording the settlement of the test platform under loading. The loading device is in the nature of a balanced scale constructed on somewhat different principle from the platform above described. The recording device of this platform is shown in Fig. II.

A pivoted straight edge is secured to the recording board, located near one edge of the compression-post. This straight edge is caused to rotate about its hinge by means of a nail driven in the compression-post at a horizontal distance of 2 inches from the hinge.

As the compression-post sinks under loading the nail causes the straight edge to rotate. A line is marked off with straight edge on a sheet of paper secured to the recording board for each increment of loading. As the post continues to settle, there will result a series of radiating lines on the paper, each representing the position of the straight edge for a different unit loading. The actual movement of the nail and consequently the compression of the soil is magnified on the paper in the ratio of the distance between the arbitrary line at which measurements are made and the hinge to the distance between the hinge and the nail in the compression-post.

This direct reading method of recording settlement may be applied to practically all types of platforms resting on vertical members, and is of advantage owing to the permanent record that is made, doing away with the uncertainties and labor of taking observations with the engineer's level.

In interpreting the result of a loading test the fact must not be overlooked that a small area will bear a larger load per unit area for a short time than a larger area continually.

B. Sand

Sand is one of the principal ingredients of both concrete and mortar. It is of importance that it be of a quality such as to realize the full strength

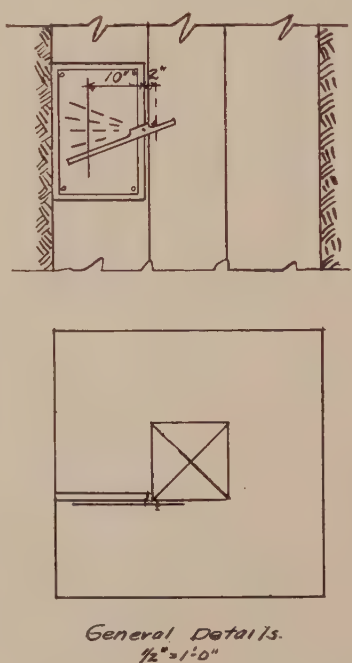


FIG. II, RECORDING DEVICE.
PROPOSED BY SPECIAL COMM. TO CODIFY PRESENT PRACTICE ON THE BEARING VALUE OF SOILS FOR FOUNDATIONS, ETC. OF THE AM. SOC. C.E.

of the cement with which it is used. There are three principal qualities of sand to look for—cleannness, sharpness, and fineness.

I. *Laboratory Tests.*—(*a*) The Joint Committee recommends that fine aggregate, including sand, be tested for strength. Mortar composed of 1 part Portland cement and 3 parts fine aggregate by weight when moulded into briquets, prisms, or cylinders should show at an age of not less than seven days a tensile or compressive strength at least equal to that of a 1 : 3 mortar of the same consistency made with the same cement and standard Ottawa sand. If the strength developed by the aggregate in the 1 : 3 mortar is less than 70 per cent of the strength of the Ottawa-sand mortar, the material should be rejected.

(*b*) The colorimeter test may be carried on as a laboratory test if so desired.

II. *Field Tests:* (*a*) *Cleanness.*—1. Loam. Test for loam by placing a handful of sand on a clean sheet of white paper, place it in the sun or near a heater to dry, and then roll the paper back and forth and note the amount of fine loam remaining on the edge.

2. Loam. Fill a pint bottle with the sand to be tested to a height of 4 inches, then add water until the bottle is nearly full, shake thoroughly, and allow the contents to settle. Owing to the varying density of the sand and loam, the sand will settle to the bottom and the loam on top. Measuring the height of the column of loam and sand with a rule and dividing the former by the latter will give the percentage of loam to sand with reasonable accuracy. The layer of loam should not be over ⅛ inch in thickness. The loam content in sand to be used for purposes of masonry should not be more than from 3 to 5 per cent of the sand.

3. Loam. Dry a small portion of sand and weigh it. Then place it in a vessel of water and thoroughly mix it. After the sand has settled, pour off the dirty water and repeat until the water pours off clear. The sand is again dried and weighed. The loss in weight is the weight of the impurities.

4. Organic Impurities. The colorimeter test for the detection of organic impurities in sand has been developed by Professor Abrams and Mr. Harder, of the Structural Material Research Laboratory of the Lewis Institute, Chicago. To quote from the circular describing the field test:

"A sample of sand is digested at ordinary temperature in a solution of sodium hydroxide (NaOH). If the sand contains certain organic materials, thought to be largely of a humous nature, the filtered solution resulting from this treatment will be found to be of a color ranging from light yellow up through the reds to that which appears almost black. The depth of color has been found to furnish a measure of the effect of the impurities on the strength of mortars made from such sands. The depth of color may be measured by comparison with proper color standards."

METHOD FOR FIELD TEST

"Fill a 12-oz. graduated prescription bottle to the 4½ oz. mark with the sand to be tested. Add a 3% solution of sodium hydroxide until the volume of the sand and solution, after shaking, amounts to 7 oz. Shake thoroughly and let stand over night. Observe the color of the clear supernatant liquid. In approximate field tests it is not necessary to make comparisons with color standards. If the clear supernatant liquid is colorless or has a light yellow color the sand may be considered satisfactory in so far as organic impurities are concerned. On the other hand if a dark-colored solution ranging from dark red to black is obtained the sand should be rejected or used only after it has been subjected to the mortar strength tests."

The following table gives an approximate idea of the use of the color of the supernatant liquid as a guide to the availability of the sand for use in concrete work as affected by its content of organic impurities:

Colorless:	Sand good for highest grade concrete.
Light amber:	" " " " " "
Dark amber:	" may be used in unimportant concrete.
Light tan:	" " " " " " "
Dark tan:	" should not be used in concrete.
Light brown:	" " " " " " "
Dark brown:	" " " " " at all.

5. Organic Impurities. A modified colorimeter test has been developed by the American Society for Testing Materials for the detection of organic matter in sand. The principal value of this test is in furnishing a warning that further tests of the sand are necessary before it can be used in the concrete.

A representative sample of the sand to be tested weighing about 1 pound is obtained by quartering or by means of a sampler. A 12-ounce graduated prescription bottle is filled with this sand to the 4½-ounce mark. A 3-per-cent solution of NaOH in water is added until the volume of sand and solution after shaking gives a total value of 7 liquid ounces. The bottle is then stoppered and thoroughly shaken, and allowed to stand for twenty-four hours.

A standard color solution is prepared by adding 2.5 c.c. of a 2-per-cent solution of tannic acid in 10 per cent alcohol to 22.5 c.c. of a 3-per-cent solution of sodium hydroxide. This is placed in a 12-ounce prescription bottle, stoppered, and allowed to stand for twenty-four hours, when 25 c.c. of water is added.

The color of the clear liquid above the sand is compared to that of the standard color solution. Solutions darker in color than the standard have a "color value" higher than 250 parts per million in terms of tannic acid.

Sands which produce a color in the NaOH solution darker than the standard should be subjected to strength tests in mortar or concrete before use.

6. Salt. It may be advisable to test the sand for the presence of salt. The method used is to place a small portion of sand in a clear bottle filled with distilled water. After shaking it, allow it to settle. Add a few drops of pure nitric acid and then a few drops of a solution of nitrate of silver. A white precipitate indicates the presence of salt.

7. Cleanness. Thoroughly mix a half cup of cement and sand in the ratio of 1 : 3 with enough water to form a paste that can be moulded into a compact ball in the hands. Place the ball on a piece of glass or metal and set it in the basement or any place where the temperature is between 50 and 80 degrees Fahrenheit, and where it will not dry rapidly. If the mortar is soft enough after forty-eight hours to be broken in the hands it is advisable to examine the sand for cleanness.

(*b*) *Sharpness.*—1. The sharpness of the sand may be determined approximately by crunching a handful held close to the ear and noting the sound, which for a sharp sand should be hard and grating.

(*c*) *Fineness and Grading.*—The best concrete or mortar is that which has the least volume for a given weight of ingredients. This means that the aggregates should be so graded in size as to reduce the interstices to a minimum.

1. Sieve Analysis. Field tests to determine the grading of the sand necessary to produce this dense concrete

are made by means of a so-called "sand tester," and are called granulometric, or sieve analysis. This sand tester is a device having five screens of 6, 10, 20, 35, and 65 meshes to the inch respectively, each screen in succession having openings one-half the width of openings in the preceding screen. The instrument itself consists of a water-tight cylinder containing these five screens, a series of glass phials each connected to one of the five screens, and means of holding and making a graphical record of the results of the test. Wet screening of the sand is used, as it is more efficient than where dry sand is used.

The first operation in making a test is to place a measureful of sand in the casing by an opening at the end, then fill with water until it shows above the first screen. The second operation consists of imparting a reciprocating motion to the instrument, holding it with the phials uppermost. Accenting the downward stroke tends to cause separation of the materials by the wave-action of the water. After thoroughly shaking, the instrument is turned upside down, so that the phials are on the lower side. It is then gently shaken, so that all materials retained on the sieves are deposited in the corresponding phials. The record-sheet is then placed on the plate, and by successive placings of the index at the top of the sand in the successive phials, drawing pencil lines along the index across the record-sheet each time, and placing this pencil line successively level with the bottom of the next succeeding phial, the record is formed.

These results are platted as a curve, with the percentage retained on sieves as ordinates, and the diameter of the particles in inches as abscissa. This curve is compared with a predetermined curve composed in a like manner for the grading of sand that gives a concrete of known strength (determined by mechanical tests). In other words, the remaining ingredients being equal, comparison is made between the grading of the sand under test and that of a sand taken as a standard (that makes concrete of known strength). The sand under test may then be screened and recombined in the proper proportions to give a concrete of any desired strength. A variation of 3 per cent either way is permissible in making this test.

2. Voids. The volume of voids in a sample of sand may be determined by placing a known volume of sand in a measuring vessel containing water. The volume displaced by the sand substracted from the original volume will give the volume of voids. The sand should always be poured into the vessel of water rather than vice versa, as this method permits the escape of whatever air there may be present in the sand.

3. Voids. The percentage of voids may be determined by weighing a measured sample of dry sand and applying a specific gravity of 2.65, which is the average for the materials of which sand is composed. The volume of the solid material will equal its weight per cubic foot divided by the product of its specific gravity and 62.5 (the weight of a cubic foot of water). In this case the volume will equal the weight divided by 62.5 x 2.65 or 166. The percentage voids may be determined from the relationship, $P = 100 \frac{(1\ W)}{166}$, where P = per cent of voids and W = weight of a cubic foot of sand.

III. *Inspection:* (*a*) *Cleanness.*—A handful of sand from the pile is squeezed and rolled together in the palm of the hand. The hand is then opened and the sand brushed off. The amount of dirt remaining on the hand is a good indication of whether or not there is loam present in the sand.

(*b*) *Sharpness.*—Investigation of the sand under a magnifying-glass will give a good idea of the relative sharpness of the individual grains of sand.

(*c*) *Fineness and Grading.*—Inspection under the magnifying-glass will give some idea as to the grading of size of the individual particles of sand.

C. Coarse Aggregate

No concrete can be stronger than the coarse aggregate of which it is composed. It is for this reason that care should be used in the selection and inspection of all materials destined for use in this connection.

(*To be continued*)

City Tree-Planting

ANCIENT and universal as is the practice of tree-planting, the effective use and selection of trees for street use is a matter very little understood. Even with the increase of pretension and achievement in the city-building of modern times, the arrangement and selection of the trees planted along our thoroughfares has not received study and attention commensurate with its importance. This is more true in America than in Europe, where the French and German city-builders are ahead of us in this respect, just as they are in the architectural and the engineering design of city ways and formal open places. This is due to the fact that nine-tenths of our city-street design and construction here in America is in the hands of untrained men. Our planting is almost always the work of nurserymen or gardeners, while the majority of our road engineers have been trained as civil engineers only.

The only original type of street planting which we seem to have worked out with any degree of success in America is the planting of native elms and maples along our village streets, and often the spacing was altogether too close for best effects. This was more the result of chance than of design. Being familiar with the elm and maple as a street tree in the older country, our forefathers in New England planted these trees along their wide streets and village greens. The American elm, which is a larger and more beautifully picturesque tree than its English brother, was used, and these streets, in the course of a century or so, presented a truly magnificent sight.

The result has been that ever since we have sought to reproduce these elm and maple lined New England streets, and even as our towns have grown to cities, we have followed this custom blindly, never pausing to think that conditions have become rapidly and radically different. To-day, although we may have many beautiful elm-shaded streets, we have, particularly in New England, many more wherein the tree-planting consists of but broken lines of dead or dying elms, owing to the ravaging attack of the elm-leaf beetle. In these infested sections their persistence continues in spite of all preventative measures, and planters are abandoning the use of the American elm.

From an article by T. Glenn Phillips, landscape architect and city planner, in the report of the Detroit City Plan Commission.

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Cram & Ferguson, Architects.